

Impact of Midnight Thermosphere Dynamics on the Nighttime Middle- and Low-latitude Ionosphere

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Simulations using the coupled Whole Atmosphere Model and Global Ionosphere Plasmasphere Model (WAM/GIP) have successfully reproduced the unusual upward drift during the post-midnight period (~2-3 LT) that were observed by C/NOFS satellite during the recent solar minimum. Model produces significant day-to-day variability in the nighttime equatorial ionosphere and also reveals strong seasonal and longitudinal dependence of the nighttime upward drift. Our analysis indicates that the upward drifts are driven by thermosphere dynamics associated with the midnight temperature maximum (MTM). The MTM locally reverses the typical large-scale zonal and meridional wind pattern, in turn affecting the nighttime F-layer electrodynamics. The longitudinal variation of the drifts depends on the magnitude and position of the MTM peak relative to the magnetic equator. In this talk, we will present the morphology and characteristics of the post-midnight upward drift shown in the simulations and explain its causal mechanism. Additionally, simulation of growth rate of Rayleigh–Taylor instability associated with the nighttime upward drift and brightness waves produced by the MTM will also be discussed.

Keywords: Midnight Temperature Maximum, Low-latitude ionosphere, Equatorial Vertical Drift