

## Thermospheric tidal effects on the ionospheric midlatitude summer nighttime anomaly

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This study use a 3D physics-based ionospheric model, SAMI3, coupled with the National Center for Atmospheric Research Thermosphere Ionosphere Electrodynamics General Circulation Model (TIEGCM) and Global Scale Wave Model (GSWM) to simulate the mesospheric and lower thermospheric tidal effects on the development of midlatitude summer nighttime anomaly (MSNA). Using this coupled model, the diurnal variation of MSNA electron densities at 300 km altitude is simulated on both June solstice (day of year (DOY) 167) and December solstice (DOY 350) in 2007. Simulation results show successful reproduction of the southern hemisphere MSNA structure including the eastward drift feature of the southern MSNA, which is not reproduced by the default SAMI3 runs using the neutral winds provided by the empirical Horizontal Wind Model 93 (HWM93) neutral wind model. A linear least squares algorithm for extracting tidal components is utilized to examine the major tidal component affecting the variation of southern MSNA. Results show that the standing diurnal oscillation component dominates the vertical neutral wind manifesting as a diurnal eastward wave-1 drift of the southern MSNA in the local time frame. We also find that the stationary planetary wave-1 component of vertical neutral wind can cause diurnal variation of the summer nighttime electron density enhancement around the midlatitude ionosphere.

Keywords: Midlatitude Summer Nighttime Anomaly, thermospheric tidal effect