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Dynamical perturbations of the thermosphere inferred from satellite observations of O(1D) nightglow

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Manifestations of thermospheric dynamics have been observed in the variations of the upper atmosphere density, temperature, neutral winds and F-region plasma over a wide time range. These fields are influenced by perturbations propagating vertically from the lower and middle atmosphere (e.g. tides) and from above through variations in the solar and geomagnetic activity. The Wind Imaging Interferometer (WINDII) flown on the Upper Atmosphere Research Satellite provides multiyear observations of O(1D) nightglow volume emission rates, Doppler temperatures and neutral winds over the altitude range of 150 – 300 km with continuous latitude coverage of 42°N – 42°S. These data are employed in the study of the global and seasonal extent and variability of the thermospheric midnight temperature (MTM), a large scale neutral temperature anomaly with wide-range effect on the nighttime thermospheric dynamics at low latitudes. It is found that the MTM extends well into midlatitudes and coincides in local time with the appearance of a wave 4 signature, observed in the vertical and zonal variability of the O(1D) volume emission rates, Doppler temperatures and neutral winds (zonal and meridional).
The current understanding is that the wave 4 is associated with non-migrating tides propagating upward from the lower atmosphere. The vertical and global extend of the wave 4 as the source of the MTM will be discussed.

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