

Solar cycle variations in the mesopause temperature and F2 peak electron density

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We present the results of analysis of seasonal and year-to-year variations in the mesopause temperature (Tm) in current 24th solar cycle. The analysis is based on 2008-2017 dataset obtained from spectrometric measurements of the OH emission (834.0 nm, band (6-2)) at the Geophysical Observatory of the Institute of Solar-Terrestrial Physics (51.8 N, 103.1 E, Tory). The measurements are carried out in nighttime with temporal resolution 10 minutes. OH rotational temperature is determined with 1-2 K accuracy and corresponds to the atmosphere temperature at the emission layer height (the mesopause region).

Using harmonical analysis, we obtained mean temperatures, amplitudes and phases of annual harmonics for the period 2008-2017. These values were compared with solar and geomagnetic activity variations. The year-to-year changes of the mesopause temperature and peak electron density (NmF2) variabilities caused by manifestations of the activity of atmospheric waves were investigated. The patterns of the NmF2 and Tm variability in different period ranges were analyzed and compared. The period range included day-to-day (periods $T > 24$ hrs) and tidal ($8 \text{ hrs} < T < 24 \text{ hrs}$) variations, as well as variations in the internal gravity wave period range ($T < 8 \text{ hrs}$).

Data on F2 peak electron density NmF2 were obtained from Irkutsk DPS-4 Digisonde (52.3 N, 104.3 E). We revealed that annual mean NmF2 variability agrees well with geomagnetic activity only for daytime day-to-day variations. There is no clear correlations between year-to-year patterns of Tm and NmF2 variabilities.

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