Comparison of temperature in the upper mesosphere from lidar measurements, satellite and model data and from ground-based measurements of hydroxyl emission

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Temperature at the mesopause level is monitored at the Zvenigorod Scientific Station of the A.M. Obukhov Institute of Atmospheric Physics RAS (ZSS IAP RAS) since the late 1950s (Shefov et al., 2006). This temperature is detected with a diffraction spectrograph from the hydroxyl emission spectra with the maximum emission at an altitude of about 87 km (Semenov et al., 2002; Shefov et al., 2006). Since 2011, the Fedorov Institute of Applied Geophysics has been measuring vertical distributions of temperature and ozone content in the atmosphere with a multifunctional high-altitude sounding lidar. In March 2015, a series of joint lidar (Moscow, 56°N, 37°E) and spectrophotometric (ZSS IAP RAS, 56°N, 37°E) temperature measurements at the mesopause level were conducted. During the lidar soundings, the altitude distributions of the atmosphere temperature were determined up to a height of about 100 km. The temperature profiles from lidar measurements were compared with satellite (AURA, TIMED/SABER), model (CIRA) temperature data.

Figure 1 presents the altitude profiles for temperature from the lidar measurements in comparison with satellite measurements and CIRA model data and with temperature data from spectral measurements of the hydroxyl emission.

The results of the comparison show quite a good agreement for temperature from lidar and hydroxyl emission measurements.

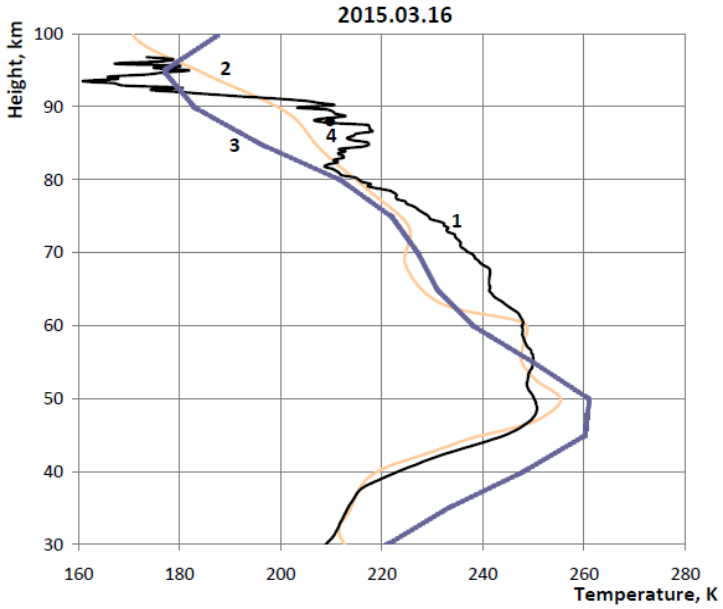

Fig. 1a

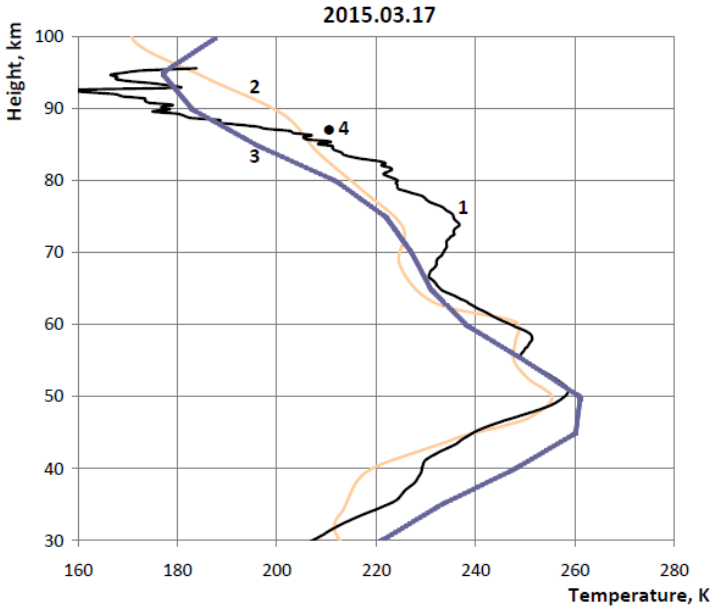

Fig. 1b

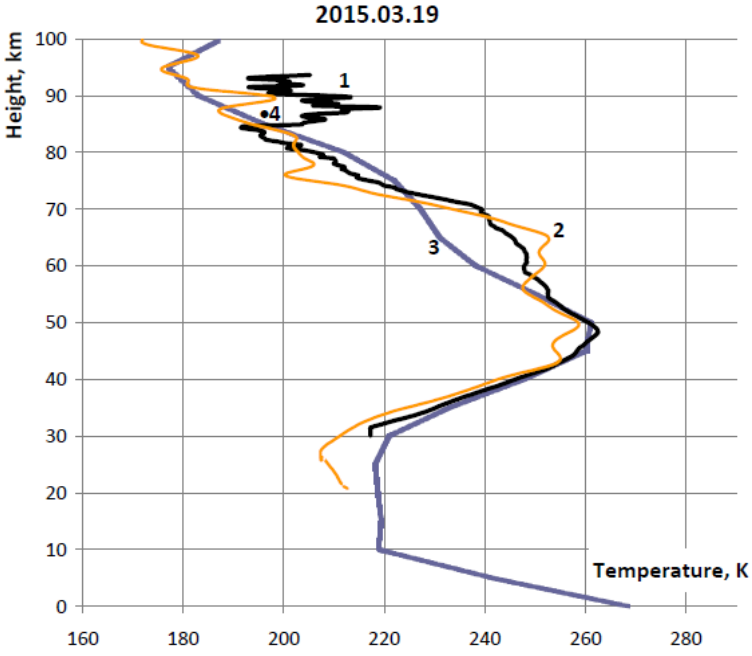

Fig. 1c

Fig. 1. Comparison of temperature profiles for Moscow region from lidar measurements (1) with satellite data (2) and CIRA model (3) and also with temperature at the mesopause from ground-based measurements of hydroxyl emission (4- black circle): a) 16.03.2015, b) 17.03.2015, c) 19.03.2015.

References

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