

УДК 551.554

WIND PROFILES ABOVE MOSCOW BY LONG-TERM SODAR DATA

Mikhail A. Lokoshchenko \*

*M.V. Lomonosov Moscow State University, Moscow, Russia*

The main results of the acoustic remote sensing of the atmosphere in Moscow are presented. The MODOS Doppler SODAR produced by METEK (Germany) operates at Moscow University since 2004. Its operation frequency is 2000 Hz, the sounding range is from 40 to 500 m, temporal and spatial resolution is 10 min and 20 m, respectively. As a result of long-term sounding, data sampling during 20 years involves more than 7 millions of individual values of wind speed and wind direction at each level. The annual course of wind speed demonstrates the maximal values in autumn and winter, and the minimal ones, in summer; this is explained by frequent intense gradient currents during the cold period in Moscow. The diurnal course of the wind speed  $V$  is characterized by the daytime maximum and night-time minimum in the layer up to 40–60 m and, vice versa, the daytime minimum and night-time maximum are observed at heights above 140–160 m. Thus, the layer from 80 to 120 m approximately corresponds to the height of the wind rotation; the diurnal course there is poorly pronounced and characterized by the minimum in the morning. The maximum wind speed over Moscow on average of 10 min in the air layer up to 500 m may reach 30–35 m/s in rare cases if two conditions concur: Moscow is located on the periphery of deep cyclones and the local low-level jet stream exists. The top of quasi-linear section of the average long-term profile of  $V$  in semi-logarithmic coordinates is 40–60 m (it may be accepted as the surface air layer height if average conditions are close to neutral stratification); the roughness length is  $\sim 5$  m. According to the criterion of the constant wind direction in the surface air layer, its height in the monthly averaged wind direction profiles over the “dead zone” (40 m) is in approximately one out of three cases and usually amounts to 60 m (sometimes 80 or even 100 m). Following this approach, the average height of the surface layer is probably a little less than 50 m, which is close to the first estimation. The wind direction has a stable southwestern mode in 20 years on average. The rarest wind direction over Moscow is the north-northeastern one. The average right wind shear in the air layer of 40–500 m is  $20^\circ$ .

<https://doi.org/10.46991/PYSUC.2026.SI1.002>

**Keywords:** wind speed, wind direction, right turning, surface air layer height, roughness length.

**Acknowledgment/** This work is supported by Russian Science Foundation, project No 26-27-20046.

**Funding:**

**References:** Lokoshchenko M.A. On Height of the Surface Air Layer by Sodar Data. *Izv. Atmospheric and Oceanic Physics* **60** (1) (2024), 59–66.  
<https://doi.org/10.1134/S0001433824700063>

---

\* **Corresponding Author:** Mikhail A. Lokoshchenko, Leading Scientific Researcher, M.V. Lomonosov Moscow State University, Leninskie Gory, 1, Moscow, Russia. E-mail: [loko@geogr.msu.ru](mailto:loko@geogr.msu.ru)