Abstract

The lower 200 meters of the atmospheric boundary layer (ABL) is characterized by a high amount of atmospheric pollutants, whose distribution and transport can be predicted based on vertical profiles of specific physical parameters. Therefore, acquiring detailed vertical profiles in this range is essential.

Traditional methods of measuring vertical profiles are not fully applicable in the context of the SL range. Radiosondes are not designed for frequent measurement of vertical profiles within 200 meters, and remote sensing methods often lack the spatiotemporal resolution needed for detailed measurements of such profiles, can monitor only certain parameters, have specific operational characteristics, and are associated with high costs.

In contrast to these methods, the use of a drone as a mobile platform offers advantages in the form of high spatiotemporal resolution and the ability to profile at short intervals, which enables the capture of detailed dynamics of vertical profiles within 200 meters.

In this work, using the DJI Air 2s drone equipped with an iMet-XQ2 sensor, measurements of temperature (T) and relative humidity (RH) vertical profiles were conducted. The drone's vertical ascent speed was approximately 1 m/s, so measuring a profile up to 120 meters typically took about 120 seconds, with the entire measurement taking around 3-4 minutes. Between measurements of individual profiles, the potential temperature (θ) was immediately calculated, which, along with the measured data, was continuously displayed in graphs, thus providing a comprehensive overview of the stable condition of the lower part of the atmospheric boundary layer. The interval between individual profiles was 10 to 15 minutes.

This method of measuring vertical profiles of temperature and RH with a drone and subsequent evaluation allows for obtaining an online daily progression of the required stable condition of the lower part of the atmospheric boundary layer.

Key words: temperature, relative humidity, atmospheric boundary layer