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Characteristics of Atmospheric Turbulence According to the Perm Rawinsonde Station

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New technical tools allow high-resolution measurements of atmospheric characteristics and create new opportunities for assessing the intensity of turbulent exchange in the atmosphere. The results of applying the Thorpe's method for studying the parameters of atmospheric turbulence in Perm are presented. The Thorpe's method requires initial data with high temporal resolution. The study was based on data of radiosonde observations with a discreteness of 2 s at the Perm aerological station during 2018–2024. The study showed that the analyzed method provides quite accurate quantitative estimates of the turbulent characteristics of the atmosphere. In summer, the size of turbulent eddies in the boundary layer is on average 200–300 m, and the one in the free atmosphere reaches 50–70 m. The energy dissipation rate throughout the atmosphere varies from 10^{-6} to 10^{-1} m²/s³, and the turbulent diffusion coefficient ranges from 10^{-2} to 10^2 m²/s. During winter, the size of turbulent eddies ranges within 10–20 m, the energy dissipation rate varies from 10^{-6} to 10^{-5} m²/s³, and the turbulent diffusion coefficient ranges from 10^{-2} to 10^{-1} m²/s.

Keywords: atmospheric instability, turbulence, eddy scale, turbulence dissipation rate, turbulent diffusion coefficient

Tab. 1. Fig. 6. Ref. 40