

ON THE ROLE OF AIR TURBULENT DENSITY ON VARIABILITY IN THE SURFACE LAYER STRUCTURE AND TURBULENT TRANSFER

I. Litvina (1), A.Litvin (2), E.Takle (3)

(1) Agrophysical Research Institute, St. Petersburg, Russia, ivl@agrophys.spb.su,

(2) Krylov Shipbuilding Research Institute, St. Petersburg, Russia, (3) Iowa State University, Ames, IA, USA

The field of atmospheric turbulent density is of significant importance in dynamics of the stratified surface layer. However, the role of air density fluctuations has not been sufficiently described. In this paper we use the results of experimental study to quantify the contribution of air turbulent density to energy exchange and scalar turbulent transfer. Simultaneous measurements of atmospheric density, temperature, and velocity fluctuations were made in the field conditions by use of advanced equipment. It is shown that a vertical microstructure of thermal stability exists in the lower part of the surface layer, which is characterized by alteration of intensities and scales of turbulent density, temperature, and velocity within sublayers. Air turbulent density reveals more essential sensitivity to variability in local stability conditions as compared to that for temperature fluctuations. Intensity of turbulent density stipulates different mechanisms of buoyant turbulent kinetic energy production and turbulent transfer of heat and water vapour as well, within thin vertical elements of structure of the wind flow near the surface.