



## **Helicity and potential vorticity in the surface boundary layer turbulence**

Otto Chkhetiani (1,2), Michael Kurgansky (1), Boris Koprov (1), and Victor Koprov (1)

(1) A.M.Obukhov Institute of Atmospheric Physics, Russian Academy of Sciences, Moscow, Russian Federation, lgg@ifaran.ru, (2) Space Research Institute, Russian Academy of Sciences, Moscow, Russian Federation

An experimental measurement of all three components of the velocity and vorticity vectors, as well as the temperature and its gradient, and potential vorticity, has been developed using four acoustic anemometers. Anemometers were placed at vertices of a tetrahedron, the horizontal base of which was a rectangular triangle with equal legs, and the upper point was exactly above the top of the right angle. The distance from the surface to the tetrahedron its base was 5.5 m, and the lengths of legs and a vertical edge were 5 m. The measurements were carried out of total duration near 100 hours both in stable and unstable stratification conditions (at the Tsimlyansk Scientific Station in a uniform area of virgin steppe 700 x 650 m, August 2012).

A covariance–correlation matrix for turbulent variations in all measured values has been calculated. In the daytime horizontal and vertical components of the helicity are of the order of  $-0.03$  and  $+0.01$  m s<sup>-2</sup>, respectively. The nighttime signs remain unchanged, but the absolute values are several times smaller. It is confirmed also by statistics of a relative helicity. The cospectra and spectral correlation coefficients have been calculated for all helicity components. The time variations in the components of “instantaneous” relative helicity and potential vorticity are considered. Connections of helicity with Monin-Obukhov length and the wind vertical profile structure are discussed.

This work was supported by the Russian Science Foundation (Project No 14-27-00134).