Geophysical Research Abstracts, Vol. 8, 07871, 2006
SRef-ID: 1607-7962/gra/EGU06-A-07871

Parameterization of the PBL over orographic-thermal nonhomogeneities with some applications in synoptic and climatic aspects

E. Syrakov, M. Tsankov

University of Sofia, Faculty of Physics, Department of Meteorology and Geophysics,Bulgaria. (esyrakov@phys.uni-sofia.bg / Phone: +359 (2) 8161 315 / Fax: 359 (2) 962 5276)

It is developed an approach for parameterization of PBL taking into account the joint effects of orography $Z_0\,(x,y)$, "thermal topography" $\delta\theta\,(x,y) = \theta_H - \theta_0\,(x,y)$, surface friction and baroclinicity. From general hydrodynamic considerations follow that in this case, the basic turbulent characteristics like, drag coefficient, angle of full turning of the wind in PBL, vertical velocity $W_H$on the top of PBL, depend significantly on the form of the horizontal nonhomogeneities. For taking into account these effects, in arbitrary point in its vicinity, it is developed in Taylor's series$Z_0\,(x,y)$ and $\delta\theta\,(x,y)$, which leads to a new group of parameters, connected with the first and second derivatives (e.g. the laplacians), characterizing the form of $Z_0\,(x,y)$ and $\delta\theta\,(x,y)$. On the basis of the dynamic and continuous equations, and some other considerations, it is determined the explicit dependence of the studied turbulent parameters on these form parameters, friction and baroclinicity.

For example for W_H, it is obtained the expression$W_H = W_I + C\Omega_g + \Delta W$, where the first two terms are the traditional for horizontal-homogeneous case and $W_H$is correction accounting the effects connected with the horizontal nonhomogeneities.

By using the $W_H$forcing, it is investigated the influence of the mentioned factors on the height H of PBL, the forming of dynamic-thermal generated "equivalent" topography (non following the relief), some coastal zone processes connected with the angle of flowing and the change of the orographic-thermal characteristics.

In climatic aspects it is analyzed significant correlation between the terms of the formula of W_H, containing the laplacians $\Delta Z_0\,(x,y)$ and $\Delta\delta\theta\,(x,y)$ and zones with

raised climatic activity (these correlations are based on the fact that the mentioned terms are invariant about the coordinate system and do not also depend on the wind direction - because of quadric dependence on it, which leads to accumulation of significant climatic effects).

The result may be utilized, for example, in the determination of the lower boundary condition, which parameterizes the orographic-thermal in homogeneities in weather and climate models