Geophysical Research Abstracts,
Vol. 10, EGU2008-A-12284, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-12284
EGU General Assembly 2008

A features of turbulent transfer of momentum and heat in stably stratified boundary layer above the rough surface

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A numerical model to represent the impact of large-scale roughness area on airflow in the meso'scale atmospheric models is presented. In the model, the roughness elements are not explicitly resolved, but their effects on the grid-averaged variables are parameterized. The improved, three-parametric turbulence model [1-3] for the computation of the wind field, temperature and pollutant dispersion was developed. The transport of momentum, heat and mass under the unstable and stable stratification is evaluated from the fully explicit anisotropic algebraic expressions. These expressions are derived based on the assumption of weak-equilibrium turbulence approach where transport effects on the turbulent stresses and heat fluxes are negligible but the stratification effects on the turbulent transfer are considered precisely. In particular, the vertical heat flux expression includes an additional countergradient term. The turbulent momentum and heat fluxes models encapsulate substantial physics and dynamics of atmospheric stratified flows. The comparison of the computational results obtained with the present model and existing observational data and numerical models shows that the present model is capable of predicting the structure turbulence in the daytime and nocturnal atmospheric boundary layer and of obtaining local wind and temperature with high-resolution.