

Coherent motion of turbulence structure in developing atmospheric boundary layer and its sensitivity to landuse condition

*Aiko Yakeno¹, Ryo Onishi¹, Keigo Matsuda¹

1. Japan Agency for Marine-Earth Science and Technology

We have conducted large eddy simulation (LES) with high resolutions of 2 or 5 meter around a real city of 5.0 times 5.0 square kilometers based on GIS data. The atmospheric boundary layer develops within the computational domain over a field area in the North east and a residential area in the South west (Fig. 1). The main wind direction is the East southeast. Colored transparent contour In a center of the figure represents an instantaneous vertical velocity, v_r , at the height of 10 meters from a ground. A streaky pattern of the velocity appears in the downstream. Though the coherent motion of a structure has been discussed in literature, its generation mechanism, sensitivity to landuse condition and influence on the upper scale flow characteristics are not clarified sufficiently. In the study, we consider location height, wave length of the coherent structure and factors to develop the atmospheric boundary layer. We have compared root mean square values of vertical velocity for cases of with or without heat transfer of the ground. Values were spacially averaged for each region; the upstream/downstream and residential area/grass field. Two peaks in the vertical direction are identified for whole cases. It is considered to be related with the internal and outside boundary layers known in a reference (1).

(1) Garratt, J. R., "The internal boundary layer - a review" , Boundary-Layer Meteorology, Volume 50, Issue 1, pp. 171-203 (1990).

Keywords: atmospheric boundary layer, turbulence, canopy

