Geophysical Research Abstracts, Vol. 9, 04379, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-04379

Conceptual models of the atmospheric surface layer: statistical assessment as a function of stratification using SIRTA observations

C. Fesquet(1), **P. Drobinski**(2), T. Dubos(1), C. Barthlott(3) and C. Pietras(1)
(1) IPSL/LMD, (2) IPSL/SA, (3) IMK

For the last 50 years Monin-Obukhov similarity theory has provided a foundation for nearly all models of the atmospheric surface layer. The theory assumes that turbulence consists of small parcels of fluid (eddies), with short lifetimes and erratic movements with respect to the mean flow. Such eddies respond only to local conditions in the flow, so larger-scale influences are not considered. Recently, two new models have been developed which assign much greater importance to the turbulence in the outer parts of convective boundary layer. The new models of Hunt and Morrison (HM) and McNaughton (McN) both see the turbulent surface layer as being the direct product of eddies from the convective outer layer interacting with the ground. Hunt and Morrison propose that eddies from the outer layer impinge onto the surface where they are blocked by the surface and sheared by the mean wind, causing distortion. By contrast, McNaughton proposes that the eddies from the outer layer create variable shear across the whole surface layer, which shear powers the development of structures within the surface layer. These two conceptual models imply different shapes of the wind fluctuations spectra.

The present study investigates statistically the turbulence spectra of the velocity components for all stability conditions in order to discuss the validity of the two different models in the “real” atmosphere. This study uses turbulence measurements collected at the SIRTA observatory, located at Palaiseau, 20 km south of Paris, France, since April 2005. The results show that the stratification seems to have an important impact on the eddies motion in the surface layer: First analysis tends to show that the HM model is better support in stable and near-neutral stratification whereas the McN model seems better suited for unstably stratified planetary boundary layer.