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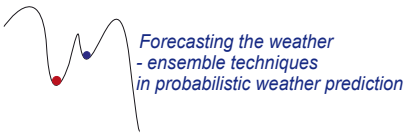

Short time variability in the structure parameter of temperature

M. Braam (1,2), F. Beyrich (1), and A.F. Moene (2)

(1) German Meteorological Service, Meteorological Observatory Lindenberg, Lindenberg, Germany , (2) Wageningen University, Meteorology and Air Quality, Wageningen, Netherlands

The structure parameter of refractive index of air (C_{n^2}) is the basic parameter derived from the scintillometer data. It can be linked via the structure parameter of temperature (C_{T^2}), humidity (C_{q^2}) and the cross structure parameter of temperature and humidity (C_{Tq}) to a path averaged surface sensible and latent heat flux. C_{x^2} is a measure of turbulent quantity in space and time within the inertial sub-range, where turbulent energy is transferred from larger to smaller eddies and not produced (scales $> L_0$) or dissipated (scales $< l_0$). The spectral domain of this range is located between the outer scale ($L_0 \approx \kappa \cdot z = 0.4z$) and the inner scale ($l_0$). The structure parameter is a local quantity of a turbulent field and is therefore variable along the scintillometer path, due to spatial heterogeneity and turbulence. Furthermore, it has a log-normal distribution in time Cheinet09 indicating that the variability is strong. In July 2009 a field experiment was performed around the Meteorological Observatory Lindenberg of the German Meteorological Service (DWD) (LITFASS-2009). In this field experiment eddy-covariance techniques, scintillometer, unmanned aircraft and large eddy simulation (LES) modeling were combined, in order to better understand the influences of surface heterogeneity along the scintillometer path on the spatial variability of C_{x^2}. However, if spatial variability is investigated, one is often only interested in the influence of surface heterogeneity only rather than temporal turbulent variation. Therefore, it is essential to decompose the two causes. A method to focus on the contribution of turbulence only is to investigate the short time temporal variability of C_{x^2}. In this research we will focus on the short time temporal variability of the structure parameter of temperature obtained by sonic anemometer/thermometer measurements performed during the LITFASS-2009 experiment. The statistics of the temporal variability in C_{T^2} is compared with other turbulent quantities in the atmospheric surface layer.

Cheinet, S. and P. Siebesma, 2009: Variability of local structure parameters in the convective boundary layer. *Journal of the Atmospheric Sciences*, **66 (4)**, 1002–1017.