EMS Annual Meeting Abstracts,
Vol. 6, EMS2009-174, 2009
9th EMS / 9th ECAM

9th EMS Annual Meeting
9th European Conference on Applications of Meteorology
High resolution meteorology
- applications and services

Validation of scintillometer measurements over a heterogeneous landscape: The LITFASS-2009 Experiment

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The turbulent exchange of heat and water vapour are essential land surface – atmosphere interaction processes in the local, regional and global energy and water cycles. Scintillometry can be considered as the only technique presently available for the quasi-operational experimental determination of area-averaged turbulent fluxes needed to validate the fluxes simulated by regional atmospheric models or derived from satellite images at a horizontal scale of a few kilometres. While scintillometry has found increasing application over the last years, some fundamental issues related to its use still need further investigation. In particular, no studies are known so far to reproduce the path-averaged structure parameters measured by scintillometers by independent measurements or modelling techniques.

The LITFASS-2009 field experiment has been performed in the area around the Meteorological Observatory Lindenberg / Richard-Aßmann-Observatory in Germany during summer 2009. It was designed to investigate the spatial (horizontal and vertical) and temporal variability of structure parameters (underlying the scintillometer principle) over moderately heterogeneous terrain. The experiment essentially relied on a coupling of eddy-covariance measurements, scintillometry and airborne measurements with an unmanned autonomous aircraft able to strictly fly along the scintillometer path. Data interpretation will be supported by numerical modelling using a large-eddy simulation (LES) model. The paper will describe the design of the experiment. First preliminary results from the measurements will be presented.