



## **Attempt to close the energy balance for the LITFASS-2003 experiment**

**T. Foken** (1), M. Mauder (1,2), C. Liebenthal (1), F. Wimmer (1), F. Beyrich (3), S. Raasch (4), H.A.R. DeBruin (5), and W. M. L. Meijninger (5)

(1) University of Bayreuth, Bayreuth, (2) now: Agriculture and Agrifood, Ottawa, (3) German Meteorological Service, Lindenberg, (4) University of Hannover, Hannover, (5) Wageningen University and Research Centre, Wageningen (thomas.foken@uni-bayreuth.de)

For the LITFASS-2003 experiment conducted through May and June 2003 in a heterogeneous landscape around the Meteorological Observatory Lindenberg of the German Meteorological Service, different aspects relevant to close the energy balance at the surface based on radiation, soil and turbulent flux measurements were investigated. The careful correction of the eddy-covariance data (and the comparison of all instruments including net radiometers) can reduce the residual of the energy balance closure, but still a significant closure gap remains. The same result was found when carefully calculating the ground heat flux including all storage terms. The use of the ogive test to estimate the energy loss for long wavelengths showed an effect of up to 5 % on the residual. Finally, energy balance closure could not be achieved for the surface layer measurements in LITFASS-2003. Recent findings of large-eddy simulations (LES) have shown organised turbulence structures in the lower boundary layer. With the application of LES and the calculation of the horizontally averaged fluxes of sensible and latent heat closure of the energy balance was possible for one selected day, when the LES was available. This result was supported by large aperture scintillometer measurements as well as by averaging of the eddy-covariance measurements over longer time periods up to ten hours. It is therefore concluded, that the energy balance closure problem is a scale problem and structures of the atmospheric boundary layer, which develop over heterogeneous surfaces, must also be taken into account.