Geophysical Research Abstracts, Vol. 7, 02332, 2005
SRef-ID: 1607-7962/gra/EGU05-A-02332

Comparisons of ABL height and surface fluxes during LITFASS-2003

B. Hennemuth (1), J. Bösenberg (1), D. Jacob (1) , A. Lammert (1)

(1) Max-Planck-Institute for Meteorology, Bundesstr. 53, D-20146 Hamburg, Germany (hennemuth@dkrz.de)

The atmospheric boundary layer is the link between the earth's surface and the free atmosphere concerning the exchange of momentum, energy, gas and matter.Its structure is - without phase changes - dominated by temperature-driven processes.Thus, the concentration of passive scalars in the boundary layer - in a first approximation also water vapour - is strongly influenced by the layer thickness and the surface and entrainment fluxes.

The atmospheric boundary layer is investigated with a ground-based water vapour lidar. Measurements comprise daytime humidity fields up to 4000 m on 26 days. The second tool is the regional model REMO with good resolution of horizontal and vertical scales. Comparisons are done for the LITFASS-2003 field experiment in eastern Germany which aimed at determination of evaporation over heretogeneous terrain. The LITFASS-2003 comprehensive data set including area-averaged surface fluxes is well suited for such studies. The measuring period in May/June 2003 was extremely dry.

REMO simulates the humidity boundary layer evolution quite well but in most cases the boundary layer is too low and too humid. Comparison of the parameterised REMO surface fluxes with LITFASS composite fluxes shows mostly too low sensible heat fluxes and too large latent heat fluxes. Only after rain events the fluxes agree better. Soil wetness which can only be compared qualitatively shows distinct differences. While the REMO soil wetness is only slightly changed by the precipitation events, there are large changes measured in the upper soil levels. After rainfall the simulated soil wetness which controls evaporation equals the measured soil wetness in the upper levels, on the other days it is too large. The height of the atmospheric boundary layer

which is derived from lidar measurements and from REMO simulations confirms deviations seen in the other parameters. In most situations - when sensible heat flux is too low - REMO boundary layer heights are too low, but agree well with lidar boundary layer heights on days after rainfall, when the simulated fluxes are correct.

Thus, the partitioning of energy at the surface is essential for correct boundary layer simulation. This underlines the importance of soil moisture in simulations which apparently has greater influence than e.g. the parameterization scheme in the model.