



Validation of Large-Eddy Simulations of the convective boundary layer against high quality comprehensive LIDAR-DIAL humidity flux measurements

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The availability of spatially and temporarily high resolved humidity flux data measured with LIDAR systems using the eddy-correlation method offers the possibility of LES model validation with measured profiles of second-order moment data. Within this framework it is of special importance to investigate 1) the LES model's capability to predict profiles of water vapour fluxes under 'real' conditions and 2) to scrutinize the statistical representativeness and accuracy of the LIDAR flux measurements by comparing these quantities with the corresponding ensemble means taken as spatial/temporal averages of LES data. The case study chosen for the comparison is based on measurements of the LITFASS-2003 (Lindenberg Inhomogeneous Terrain-Fluxes between Atmosphere and Surface: A long term study) field experiment as part of the EVA-GRIPS (Regional Evaporation at Grid/Pixel Scale) project which took place near Lindenberg/Germany. Based on the amount, quality, and completeness of observations available May 30, 2003 was chosen for the inter-comparison. During this day a cloudless convective boundary layer evolved over the observation area. This investigation shows that: (1) The LES model is capable of reproducing measured second-order moments such as humidity fluxes. (2) At least a 2D-measurement-technique is necessary to estimate covariances and moments with a specified statistical significance. (3) The LIDAR derived humidity fluxes do not well represent the corresponding ensemble averaged fluxes, but they are ideally suited for LES validation purposes due to their high spatio-temporal resolution.