Geophysical Research Abstracts
Vol. 15, EGU2013-12379, 2013
EGU General Assembly 2013

The influence of a land-lake surface discontinuity on the convective boundary layer flow

Daniel Martinez, Jens Bange, and Andreas Lang

University of Tübingen, Center for Applied Geoscience, Environmental Physics, Tübingen, Germany
(daniel.martinez@uni-tuebingen.de)

The current work addresses the effects of surface discontinuities into the atmospheric boundary layer (ABL) with free convection using data collected during the STINHO 2002 and LITFASS 2003 experimental campaigns. These field experiments were performed during two consecutive summers in the area of Branderburg, Germany, over a heterogeneous area located around the Meteorological Observatory Lindenberg (MOL) of the German Weather Service (DWD). The terrain can be considered flat with areas of pine forests and agricultural fields, where lakes and villages are irregularly distributed to form a heterogeneous landscape representative of central Europe.

Specific measurements collected by the helicopter-borne turbulence probe Helipod were selected to focus on the water-land surface transition over lake Scharnuetzel, a small-scale lake of 10 km x 2 km length scale. Four flights with a similar pattern were performed, with heights that range from 70 to 900 m above ground level (a.g.l.), in order to characterise the vertical extent of the surface discontinuity influence to the turbulent flow. The concepts of blending height and internal boundary layer (IBL) have been applied to the experimental data as a theoretical background.

In general, the presence of the lake is reflected in the statistical second-order moments of the time series collected below 100 m a.g.l., specially for those time series related with the potential temperature. However, none of the parametrizations found in the literature related with the blending height or IBL seem to be appropriate for this special case, where a small-scale lake is the responsible of the surface heterogeneity. An analysis of the downstream propagation of the IBL depth shows that it depends on (i) the air stability downwind of the surface discontinuity and (ii) the wind speed in the surface layer. These preliminary results should be confirmed with the performance of new experiments.