Geophysical Research Abstracts
Vol. 13, EGU2011-9714, 2011
EGU General Assembly 2011

Footprint under low wind conditions

Irene Lehner (1), Ivo Peter (1), and Natascha Kljun (2)

(1) Institute for Atmospheric and Climate Science, ETH Zürich, Zürich, Switzerland (irene.lehner@env.ethz.ch), (2) Department of Geography, Swansea University, Swansea, UK

Footprints give information about the upwind sources of point measurement at a flux tower. This knowledge is of special interest as surface characteristics within the footprint influence strongly the measured surface-atmosphere exchange and constitute a tool to evaluate fetch quality and to interpret flux data. The footprint depends on atmospheric stability, surface roughness, and measurement level. A number of approaches exist to predict the footprint. Here we use the parametrised version of the Lagrangian stochastic dispersion LPDM-B model (Kljun *et al.* 2004) which has the advantage of being valid for a wide range of atmospheric conditions and simple to apply for long-term measurements. The scaling parameters of the LPDM-B model are the measurement height z_m, roughness length z_0, stability parameter z_m/L, mixing layer height z_i, and friction velocity u_*.

For this study data from the pre-alpine Rietholzbach catchment in the north-eastern part of Switzerland are analysed. The tower is equipped with three ultrasonic anemometer (CSAT3, Campbell Scientific, Logan, USA) at 2, 5.5, and 9 m. At the top and bottom level an open-path CO_2/H_2O infrared gas analyser (Li7500, Li-Cor, Lincoln, USA) is installed as well. The tower is located in a grassland close to the valley bottom. Similar to many other eddy covariance measurement locations the terrain is not flat and the land use is not absolutely homogeneous (some individual trees). At the Rietholzbach site wind direction is along the valley axis from western or eastern directions and along this axis the topography is about constant with a slight slope of $<5^\circ$.

The footprint analysis is carried out for the time period from May 2009, when the measurements started, until October 2010 and focuses on the different measurement levels as well as on the seasonality of the footprint. Turbulence intensity at the Rietholzbach site with maximum values of u_* of 0.8 m s^{-1} is rather low and for about 40 % of the daytime and 70 % of the night-time situations the model restriction of a minimum u_* of 0.2 m s^{-1} is not fulfilled. Therefore, a new parameterisation of the LPDM-B model is calculated and discussed for the actual location.

Reference:
Kljun N, P Calanca, MW Rotach, HP Schmid (2004): A simple parameterisation for flux footprint predictions, *Boundary-Layer Meteorology* **112**: 503-523.