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A Simple Two-dimensional Parameterisation for Flux Footprint Predictions

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Footprint models are often used for interpretation of flux-tower measurements, to estimate location, size of source area, and contribution of passive scalar sources to these measured fluxes. With increasing numbers of flux towers within large monitoring networks (e.g., FLUXNET, ICOS, AMERIFLUX), span of observations from these towers, and availability of airborne flux measurements, there has been an increasing demand for reliable footprint models that can be applied for long time series and outside the surface layer.

In this contribution, we present a two-dimensional footprint parameterisation based on a novel scaling approach for the lateral distribution of the flux footprint and on an updated version of the footprint parameterisation of Kljun et al. (2004). Updates of the previous one-dimensional footprint parameterisation include a more reliable scaling for stable conditions and explicit consideration of the effects of the surface roughness length. The footprint parameterisation has been developed and evaluated using simulations of the Lagrangian stochastic particle dispersion model LPDM-B (Kljun et al., 2002), covering a broad range of boundary layer conditions and measurement heights.

The new footprint parameterisation requires inputs that can be determined from flux-tower measurements. It can be easily applied to data of long-term monitoring programmes as well as for quick footprint estimates in the field.

Kljun, N., P. Calanca, M.W. Rotach, H.P. Schmid, 2004: A Simple Parameterisation for Flux Footprint Predictions. Boundary-Layer Meteorology 112, 503-523.

Kljun, N., M.W. Rotach, H.P. Schmid, 2002: A 3D Backward Lagrangian Footprint Model for a Wide Range of Boundary Layer Stratifications. Boundary-Layer Meteorology 103, 205-226.