EXPERIMENTAL EVALUATION OF FLUX FOOTPRINT MODELS

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The widespread use of footprint estimates in conjunction with eddy covariance measurements illustrates that flux footprint modelling is an important and therefore commonly used data quality assessment tool in micrometeorology. Mostly, analytical and computationally inexpensive models are applied, although their assumption of homogeneous turbulence is usually not fulfilled in practical flux measurement conditions. This difficulty raises the question of how reliable footprint model results are at real-world flux sites. In order to evaluate the model's performance, we conducted tracer experiments at a grassland site in Graswang, southern Germany. The site is part of the TERENO.net pre-Alps observatory and is located on a flat alluvial valley bottom (ca. 1 km wide), flanked by steep sides. An artificial tracer (methane) was released continuously over one averaging period from a surface source of $1m^2$ size. The measured flux contributions from the tracer source are compared to those predicted by footprint models. In this way the accuracy of the modelled 2-dimensional flux footprint is evaluated and the dependence of model quality on turbulence structure is analyzed. Furthermore, we investigate the extent to which potential sources on the downwind side of the measurement system contribute to the flux. We compare our measurements to estimates of analytical models as well as models based on Lagrangian stochastic particle dispersion. First results indicate that even analytical models perform adequately, except that they miss downwind source contributions which can be important.