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Spacial Representativeness of Tall Flux Tower

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We present a method for the estimation of the spatial representativeness of tall tower eddy covariance measurements monitoring a heterogeneous landscape. The approach attributes the measured signal to the different ecosystems surrounding the tall tower site. For the identification of the ecosystems, remotely sensed vegetation index time series are used. Using 250 m grid resolution defined by the available MODIS vegetation index data we quantify the spatial distribution of winter and summer crops. With a synergy of a footprint climatology for 2003-2007 and the land cover classification scheme we quantify the representativeness of the eddy covariance measurement.

It is found that 75-80% of the measured signal originates from agricultural areas, while the contribution of pastures is also relevant. Though there are important other land use types in the region (e.g. forests, settlements) their contribution to the measured signal is rather small (<5% for forested regions, <2% for urban areas). Inside the footprint area the relative importance and spatial distribution of summer and winter crops is variable among the years, which may influence the measured signal due to the different timing of the intensive carbon uptake period and harvest. The presented methodology is used to estimate summer and winter crop specific carbon dioxide exchange time series. The crop specific carbon dioxide fluxes are markedly different in each year, and exhibit strong covariance with the crop specific NDVI time series. The results suggest that the applied footprint model provides accurate footprint estimates.