



Modelling eddy covariance flux footprints over heterogeneous sub-arctic tundra

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Eddy covariance measurements are increasingly being made over areas with heterogeneous vegetation communities resulting in considerable additional challenges when interpreting flux observations. In this study a flux footprint model is used to investigate the relative influence of different elements of a sub-arctic vegetation community mosaic on the integrated fluxes measured during two growing seasons. The area fraction and flux source weight for each vegetation community found within the flux footprint was calculated for individual observation periods. This information was then used to test how representative the flux observations were for the heterogeneous landscape and to analysis the relative influence of the specific mast location. This was followed by an attempt to quantify the potential variation in observed fluxes resulting only from changes in flux footprint and to partition the integrated flux into fluxes from individual vegetation communities. The results suggest that over the two growing seasons measurements were representative for the landscape as a whole, although there was considerable variation in the vegetation community fractions in the flux footprint for individual observation periods. Small variations in mast location were also found to strongly affect the vegetation community fractions within the potential flux footprint but it was confirmed the mast location used in this study was suitably representative. The potential variation in fluxes that would be observed at the mast as a function only of modelled changes in the flux footprint was estimated using flux values obtained for the different vegetation communities from chamber-based measurements. This variation was found to be potentially of similar magnitudes to variations in daily fluxes ascribed to eco-physiological controls.