Using aircraft observations to characterise the full seasonal dynamics of evaporation and carbon dioxide fluxes from heterogeneous landscapes in the Netherlands

Ronald Hutjes, Olaf Vellinga, and Jan Elbers

Wageningen University, Earth System Sciences and Climate Change, Environmental Sciences, Wageningen, Netherlands (ronald.hutjes@wur.nl, +31317419000)

Aircraft measurements of turbulent fluxes have been made with the objective to obtain an estimate of regional exchanges between land surface and atmosphere, to investigate the spatial variability of these fluxes, but also to learn something about the fluxes from some or all of the land cover types that make up the landscape. Therefore we performed low altitude flights using a SkyArrow aircraft equipped with MFP instrumentation to measure turbulent and radiative fluxes, that are very comparable to tower based flux observations (Gioli, Miglietta et al. 2004; Vellinga, Gioli et al. 2010). In 2008, weekly transects were flown along three different trajectories in the Netherlands, so that each was covered at least once a month. These transects covered all the major landscapes representative of the Netherlands, i.e. most soil-vegetation combinations as well as build up areas.

To analyse the fluxes from the specific land cover types that make up the landscape, we employed the method developed by (Hutjes, Vellinga et al. 2010) that relies on using a footprint model to determine which part of the landscape the airborne flux observation refers to, using a high resolution land cover map to determine the fractional covers of the various land cover classes within that footprint, and finally using multiple linear regression on many such flux/fractional cover data records to estimate the component fluxes.

Thus we were able to characterise the seasonal exchange dynamics of various land cover types in the Netherlands, discriminating e.g. between grass on sandy or on peat soils, and even characterising seasonal dynamics in anthropogenic carbon dioxide emissions. Further results will be presented and methodological issue discussed.