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Comparison of NEE of a protected wetland and an extensively used grassland in the Swiss Pre-Alps

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CO_2 and H_2O vapour fluxes were measured at a protected wetland and an extensively used grassland at the Swiss CARBOMONT site on Rigi Seebodenalp (1025 m a.s.l.) using the eddy covariance (EC) method. In this presentation, CO_2 and H_2O fluxes measured at these two differently managed grassland ecosystems during the vegetation period 2003 are compared and the influence of land management on the fluxes is investigated.

The footprints of the two EC towers were determined using the analytical Korman-Meixner model. For distinct time intervals, the diurnal cycles are compared using the statistical time series analysis described by Wilks et al. (1995).

Before the first grass cut in the managed area, a slightly higher net CO_2 uptake was measured at the protected wetland. This difference can be explained by the better nutrient availability and the more favourable soil water content in the protected wetland. The grass cut disturbed the CO_2 exchange at the extensively used site substantially, whereas the diurnal cycle of the CO_2 flux at the protected and unmanaged site remained nearly unchanged.

For the period after cutting, the ratio between the CO2 fluxes measured at the protected area and the extensively used area was calculated. This ratio was then multiplied with the measured carbon fluxes at the protected site to model the expected carbon fluxes for the extensively used site after the grass cut. By comparing the modelled with the measured carbon fluxes, the impact of the grass cut at the extensively used site could be quantified.

The measured H_2O vapour fluxes are the result of losses due to soil water evaporation and plant transpiration. Although there was a strong change in the carbon fluxes due to land-management, the influence of land-management was not directly visible in the H_2O vapour fluxes. Since the plant coverage was dramatically reduced after the grass cut, the soil was heated more and evaporation was stimulated. Because of the high soil water content at this site, the reduction in transpiration after the grass cut was compensated by an increase in evaporation, suggesting that water vapour losses from both sites are mostly controlled by energy availability and not by vegetation canopy status.