



Impacts of diffuse fraction on the CO₂ exchange of five crop types grown in Switzerland

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Solar radiation, and in particular photosynthetically active radiation (PAR), reaches the vegetation in the form of direct or diffuse radiation. Even though the total amount of PAR is often smaller on days with diffuse radiation conditions than on clear days, gross primary production (GPP) is sometimes still found to be substantially increased as compared to clear sky days (Knobl and Baldocchi, 2008). Most studies so far have investigated this phenomenon for forests or in greenhouses.

In this long-term study, we assess the influence of the diffuse fraction on net ecosystem exchange (NEE, measured with the eddy-covariance technique) and GPP of five crops (winter wheat, winter barley, rapeseed, peas and Phacelia cover crop) grown in a typical 3-year crop rotation in the Canton of Solothurn, Switzerland (Swiss FluxNet site CH-Oe2). We analyse the changes in photosynthetic response to diffuse fraction over 13 growing seasons as well as the differences in the photosynthetic response between the five crops with strongly differing canopy structures. Furthermore, we compare these results with the vertical distribution of PAR across the canopy at different phenological stages, and with manually measured light-response curves to understand what drives the differences in photosynthetic response to diffuse light fraction.

Reference:

Knobl, A., & Baldocchi, D. D. (2008). Effects of diffuse radiation on canopy gas exchange processes in a forest ecosystem. *Journal of Geophysical Research*, 113(G2). doi:10.1029/2007JG000663