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Biogeosciences Discussions

Interactive comment on "The influence of leaf photosynthetic efficiency and stomatal closure on canopy carbon uptake and evapotranspiration – a model study in wheat and sugar beet" *by* A. Schickling et al.

Anonymous Referee #3

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Schickling et al. present leaf level measurements of gas exchange and flouresence of winter wheat and sugar beet, which they compare to crop level fluxes from an eddy-covariance measurement system. The basic premise for the study is that "limited data is available on the contribution of leaf physiological processes of single leaves to canopy exchange under field conditions". The authors use the leaf level measurements to interpret the observed fluxes on the canopy scale. The main findings are that canopy level fluxes are directly affected by leaf level processes and fluxes. This finding leads the authors to suggest that the physiological status of leaves should be

additionaly included in future modelling efforts.

I appreciate the effort the authors have made to undertake a large amount of varied measurements. In particular, they should be commended for taking the extra step of calculating aerodynamic conductance in an effort to better relate the canopy fluxes to those of the measured leaves. The introduction is well written and the methodoly clearly explained. That said, the results as presented in the current manuscript are not likely to be of great interest to the community of plant physiologists or terrestrial vegetation modellers. It has long been known that many plant canopies are tightly coupled to the atmosphere, and exert a direct control on canopy scale fluxes. The further claims of the authors that their results highlight the need for more physiologicaly detailed flux models are unclear. The modelling community has been focused on this question for decades, and the need for physiological realism has long been acknowledged. The authors make some vague tentative suggestions as to how to do this. Statements such as – "the use of chlorophyll flouresence of photosynthetically active leaves as it was done for many years." do not shed light as to what exactly the authors mean by introducing more physiological realism to models.

As it stands, I do not find the manuscript suitable for acceptance in Biogeosciences. There are paths the authors could explore however, to bring added value to the work. One logical extension would be to use the leaf level data they have gathered to extract physiological parameters such as the maximum rate of carboxylation and electron transport (Vcmax, Jmax) (see Gu et al., 2010), and use these to test a coupled photosynthesis-conductance model. The authors could then directly test their hypothesis that the current state-of-the-art models do not have enough realism, and identify development needs. This would be a significant contribution.

References: Gu et al. 2010 Plant Cell and Environment. Reliable estimation of biochemical parameters from C3leaf photosynthesis–intercellular carbon dioxide response curves.

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