

Interactive comment on “Species-specific temporal variation in photosynthesis as a moderator of peatland carbon sequestration” by Aino Korrensalo et al.

Anonymous Referee #2

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General comments

Korrensalo et al. have produced a detailed study with species level in vivo CO₂ exchange measurements, produced models of net (PN) and gross photosynthesis (PG) for the measured species, and compare the reconstructed PG's, extrapolated to the ecosystem, with ecosystem gross photosynthesis (GPP) derived from EC tower measurements. The comparison of such different materials are astonishingly good, and show the potential of the methods to contribute to ecosystems models. Not only limited to systems models, the results can be used to test ecological hypotheses as well.

I agree with Referee #1 that one of the most interesting issues revealed is the seasonal gap (June-July) between the PG and GPP, GPP showing higher values. The Supple-

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ment contains the estimated parameter values of the species specific, monthly light response functions. Those values somewhat considered in the discussion, but could perhaps be more utilized to inspect the species the live aggregated in the specific microforms with largest changes in LAI and coverage over the season?

The topic is highly relevant to BG, the manuscript offers good data, sound methods, and novel ideas, reaching to conclusions that nicely build on the previous work of the authors I am familiar with. There are some open questions, posed in the specific comments, that may need more work. The manuscript should be publishable after a moderate (major) revision. The issues raised by Referee #1 earlier have already been agreed by the authors in AC1.

Specific comments

1/26-27

The last inference on that "functional diversity may increase the stability of C sink of boreal bogs" comes from thin air, because the concept "functional diversity" was not opened earlier in the abstract. Please modify so that the relationship between the vascular plants and Sphagna that were used in the analyses, and functional diversity becomes clear. Alternatively, use the earlier mentioned study units instead to avoid a hop from species or growth form level to more abstract functional diversity.

2/22-29

One apparent factor may be changes in shading of moss layer due to light extinction under developing LAI and coverage. Thus the interaction with the community structure may have importance.

4/17

This is the critical period when the GPP and PG most differ.

5/4

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Were the irradiation data used logged by the EC? Was any attempts made to estimate light extinction below the changing coverage and LAI of the vasculars? If not, the irradiation seen by the Sphagna living under vasculars may be an overestimate. Could this be significant?

7/25

Alm et al (1999) reported on dry-out of mosses that did not recover in terms of photosynthetic capacity after the drought period. Comparison with this may not be valid in all communities?

7/31

Language: ... likely to be largely due to ... Uncertainty indicators twice?

7/37-38

Heterotrophic respiration is part of GPP and peaks in field just during the period with highest difference between Pg and GPP. Both WT and temperature control the oxic decomposition. WT is not in the respiration model (Eq. 2). Also perhaps shading of Sphagna. Any comments on these?

9/9

Do you refer here to the concept of functional diversity? I think you need be specific on what aspect of diversity is actually in focus here.

9/13-14

The vegetation structure with sparse or dense field layer may also affect the photosynthesis dynamics due to differences in light extinction over the growing season. Any comments on the basis of S1 table of light response parameters? Another issue is the solar declination that is latitude specific. That could affect the shaded moss assemblages?

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