Biogeosciences
Discussions

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Interactive comment on "Improved light and temperature responses for light use efficiency based GPP models" *by* I. McCallum et al.

Anonymous Referee #1

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The manuscript "Improved light and temperature responses for light use efficiency based GPP models" presents a study in which four diagnstic GPP models are compared with eddy coavriance data. For this the authors fit four eddy covariance sites in Russia to the models. The study is well written and the contribution falls well within the scope of Biogeosciences. I recommend it to be published after revision.

General comments:

The authors pretend to present "a methodology for comparing diagnostic modeling approaches" (P8920L15). Following the information, which the authors provide in the methods section, I can neither reproduce their approach nor agree on their statement. The study is rather about model performance comparison than about presenting new methods for doing so. I would either recommend rewording the corresponding section,

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or if the authors pretend to present new approaches: explain the method in more detail. The second option would bring more merit to the manuscript.

The background (introduction) is only briefly explained and needs improvement. Little more information on the differences of GPP estimation using LUE approaches and eddy techniques should be elaborated. The authors need to stress that the "GPP" as calculated from eddy measurements is – strictly speaking – not exactly the same "GPP" as modeled with LUE. There exists vast literature describing this issue. Another issue is that the authors need to link their research to related studies. Using eddy data to validate GPP models is not new. The last paragraph is rather a short description of the methods and is repeated in the corresponding section. It should thus be shifted to the Methods/Models section.

The study focuses only on four eddy sites, but according to www.fluxdata.org 14 sites are available. These sites also include further vegetation types (e.g. grassland). The authors need to state why they limit their study to this limited amount. Since they base their argumentation on the influence of latitude to the results I am wondering how further datasets would influence the results. In addition it is unclear why the study was limited to a maximum of 3 years. More years are available (e.g.: Cherskii has data from 2002 onwards and is still active), thus expansion of the study would be possible and is recommended.

Sections 2.1 (2nd paragraph) and 2.3 could be merged. A table showing major meteorological parameters (e.g. temperature, precipitation, growing degree days, etc.) would also help the reader to compare the sites more easy. Section 2.3 also needs a paragraph, which at least briefly discusses uncertainty of GPP estimates from eddy measurements.

Technical comments:

P8920L24: Citation of Quegan et al. 2011: Recent though I am not sure if this study is the most prominent and worth to be cited at this position.

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P8921L18: Makela is in fact Mäkelä, right? Please check your manuscript, because this source is cited often.

P8922L9: Citing Shvidenko et al, 2007 in the context of this sentence does not seem to be right to me.

P8922L14: Just out of curiosity: aside from fire, which "other" catastrophic disturbances do you mean?

P8926L7: The footprint of a tower strongly depends on the tower size as you correctly state. However, I personally would be careful with assuming a typical footprint to be $1km^2$, it should be smaller. It would be good if you could present the tower height in Table 1.

Sections 2.4, 2.5, 3.2: You need to find better wording. Twice "Model Evaluation" is confusing.

P8927L2: "estimated" –> better "applied"?

P8928L22: If the authors state "regional level", what regional level do they mean? Stand, Municipality, country?

Tables 2,3,4,5 need more explanation, because they are not self-explaining.

Table A1: could also be transferred to a "normal" table. However, it needs more explanation. What is a parameter value of e.g. -11:2?

Figures 3, 4: Please check the first row of both figures. The Y-axis should be consistent for all models.