

Interactive comment on “Ecophysiological modeling of the climate imprint on photosynthesis and carbon allocation to the tree stem in the North American boreal forest” by Fabio Gennaretti et al.

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A note upfront from the submitting person: This review was prepared by Bastian Buman, a master student in earth system science at the University of Zurich. The review was part of an exercise during a second semester master level seminar on “the biogeochemistry of plant-soil systems in a changing world”, which I organize. We would like to highlight that the depth of scientific knowledge and technical understanding of these reviewers represents that of master students. We enjoyed discussing the manuscript in the seminar, and hope that our comments will be helpful for the authors.

By refining the MAIDEN ecophysiological model (Gea-Izquierdo et al., 2015) and using it for a boreal black spruce (*Picea mariana* (Mill.) B.S.P.) ecosystem, the authors

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(Gennaretti et al., 2017) try to shed light on factors influencing photosynthesis-carbon allocation mechanisms. They give a detailed overview of their work and the functioning of their version of the model (→ why in the boreal zone, → what improvements/changes to MAIDEN, → how were parametrizations retrieved?) Further they test model outputs (GPP and carbon allocation) with data from eddy covariance measurements and tree ring width measurements.

This work contributes both to ecophysiological models for the boreal zone as well as to the understanding of processes that govern tree stem carbon allocation. Both of which helps to understand boreal forests (in the light of climate change, carbon stock and flux estimations). The model is able to explain 90% of the daily GPP variability and 73% of the annual ring width variability (from observations). Overall the authors demonstrate that their model is working well and that it is reasonable to use this model for the boreal zone.

Title: Maybe it would make sense to remove “the climate imprint” and “North America” from the title: Ecophysiological modeling of photosynthesis and carbon allocation to the tree stem in the boreal forest. With this the title still informs about the content of the article: modeling of photosynthesis and carbon allocation and the link to tree stem growth, and as hinted in the article, the model can also be applied to other boreal forests outside of North America → attract more readers with the article?

Material and Methods: Overall well explained but tricky to get it straight. There are many factors and parts of the model explained but it would be helpful to have some kind of flowchart that explains in which order the model runs (see e.g. fig. 1 in Gea-lzquierdo et al., 2015 or Misson, 2004).

Figure 1: This figure is not optimal, although in its core it explains the MAIDEN model, text and visualization do not support each other and partly the text is not even clearly readable:

Table 1: This table displays a significant amount of the authors work but has no real

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description.

One could argue that some parts in this chapter could be moved into the supplements: For extended reasoning to why something was done in whichever way: e.g. page 4, line 23 to 31 or page 5 lines 15 and 16, or page 7 sections 2.2.1 and 2.2.2.

Figure 2 is not really adding something to the paper. Why no move into supplement?

Chapter 2.2.3 Climate Data: Even though a considerable amount of work was put into acquiring climate data one might consider putting some part of this chapter into the supplements. This refers to the sentence ranging from line 9 to 13. It is an exhaustive sentence and could profit from a more detailed explanation within the supplements. This chapter is too long (especially compared to the discussion which is only half the size), having read this part, a reader must make a break or will lose attention during the next sections.

Results and Discussion: This part is – although to a lesser extent – still massive. It is quite difficult to find key aspects and concepts within the text. It would be nice to have a table (similar to Table 1), or bullet points or another form of highlighting of the key findings.

Figure 6: Is the indication “-1” really necessary when the title already states “previous year”?

Conclusion: Well written but also a bit too much text, one could remove lines 26 to 29 (page 12), (an interested researcher can always contact the authors for advice/guidance).

To me this article felt more like a very in-depth description or report of the whole thinking and working process of the authors rather than a concise research article. This is also applicable to the title. While this may sound hard, it essentially just indicates that the authors did a very good job of reasoning during their work and just need to shorten and distill everything down into the necessary. Or in other words, the current state of

the article presents a good opportunity for the authors to go back and figure out what they really would like the reader to take home from reading it.

References

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