Biogeosciences
Discussions

Interactive comment on "Moderate forest disturbance as a stringent test for gap and big-leaf models" *by* B. Bond-Lamberty et al.

Anonymous Referee #2

General comments I agree with the authors that there is an important task for the modelling community to improve the models ability to simulate the response of moderate disturbances. The data and methods used in this study are also appropriate to highlight this challenge. Some parts of the methods and the conclusions drawn does, however leave the room for improvement.

My main concern about this manuscript is that the authors treat a fractional decrease in LAI like it would give the same relative decrease in FPAR. In reality these fractions are not at all the same and they depend on the absolute value of LAI and the light-interception model you use. If you apply the most simple model, Beer's law assuming a light extinction coefficient (k) of 0.5 (FPAR = 1 − EXP(-LAI × k)) you would get the results from the table attached (Table 1).

For this reason, I think that FPAR from the different models has to be included in the results and that a large part of the discussion has to be rewritten, and this means a major revision.

Specified comments From parts of the abstract (11218:2-5, 22-23) and the introduction (11219:4-6) you get the impression that the study is about simulating the processes of tree mortality and moderate disturbances themselves, though what you is looking at the effect and recovery after a disturbance.

11219:5-6. "but one complicated by" is this good English?

11220:25-28. You could add that it would be for the reason to identify knowledge gaps and processes that are missing or not properly implemented for describing these mechanisms.

11221:12. Should it be "early 1900s" and not "early 1990s"?

11221:12. Frequently disturbed?

11222:3. You could briefly mention the methods used for estimating LAI and NPP as they are not so straight forward to measure and are important for the study.

11222:4. "Gough et al." twice.

11222:10-11. Fig 2 and the text (11227:25) say 37%?

11222:21. Should it be "We tested three", or did you test several models of which you only chose to show the result from three?

11223:21-25. It might read better to divide it into two sentences.

11224:20-21. I think you can reduce the number of "soil" in this sentence.

11224:25-26. How can it be that the results were so bad (11227) if the model was optimized? Why are only one parameter (maximum stomatal conductance) significantly changed while there is no or minor changes to the rest? From where have the rest of

the parameters been taken? How important are these huge deviations in absolute values for the interpretation of the results?

11225:14. "C pools and NPP noted above"?

11226:10. Can you be a little bit more specific about which parts of the trees that were removed from the forest and which parts that entered the litter pools?

11226:16. Is "and be subject to less competition" better?

11227. A table that summarizes these results is needed. It should include absolute values before and after the treatment and the relative change. It should also include the fraction of absorbed light.

11230:4. Repeated word "processes".

As said above, a lot of the discussion has to be revised as you assume that the relative change in LAI can be interpreted as change in FPAR. E.g. the conclusion "It was instead Biome-BGC that best maintained light absorption" (11230:21-22) is wrong and you have not shown that.

11232:14. Take away "remains".

11232:17-20. I would not keep the philosophical ending of the discussion.

Another aspect that could have been discussed is how the experiment is different from a real disturbance and what impact that has on the results and if the models might do better than the experiment in some respects?

There are a lot of question marks in the conclusions!

Table 1:key. Those HT max values seem high, should the unit be cm?

Figure 2. "Model performance in replicating results", I think that the English could be tightened up here. I think that it is better to explain what is shown directly than refer to Fig 1. If you include a table with absolute values you can refer to it. It would be good

to add FPAR.

Figure 3. Is this the most straight-forward way to show these results? I am not a statistician and for me it is a little bit more complicated than necessary.

Figure 4. Better to have the units directly to the y-axis. "Shading shows meteorological variability", how can there be a meteorological variability in N and C stocks? "vertical dashed line", it looks solid grey to me.

Model	LAI	LAIpost	LAIchange	FPAR	FPARpost	FPARchange
Measured	4.3	2.71	37%	0.884	0.742	16%
BBGC	1.4	1.22	13%	0.503	0.457	9%
ED	4.9	3.43	30%	0.914	0.820	10%
ZELIG	6.4	4.29	33%	0.959	0.883	8%

Fig. 1. Table 1

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