

The authors have improved the manuscript quite a lot. The discussion now contains much more explanations to bring the results into context.

I still have some more remarks, and would say that “minor revisions” are still necessary.

Furthermore, I would recommend to have a native speaker of English read over the paper with the authors. Clearer language could improve the paper even lot more I think.

Concrete remarks (line numbers refer to the revised version):

Methods:

l. 134 (new version of manuscript): Ok, but a range of mean temp values would be nice, just like for precipitation.

Description of other models: Can still be made clearer. You discuss now more the reasons for the discrepancies, but those should be easy to check from the table, for instance, in the table it only says that about VPM: “from satellite observations and NCEP Reanalysis II climate data” but you could mention that this is based on LUE.

Model explanation: Ok, thank you for adding more details in the supplements. Please also provide a reference for the performance in comparison to GCP. Also mention that it is a process-based model. In your response you also mention Xing et al. (2023), maybe you can also cite them in your S1 Text because they have a nice figure depicting BEPS. For a reader who does not know BEPS, having a graphic like their Fig 1 makes it so much easier to understand the scope of the model quickly and be able to interpret your study.

Results:

Model validation: Ok, yes, you also showed NEP. Even if you’re only interested in GPP, I find it important to also check the performance of other variables, too, to make sure the model isn’t right for the wrong reasons. But I think I am just used to models with more outputs, I would have wanted to see graphs for biomass and so on, but it seems that the model does not put these out. So I think it is ok what you did. I just believe that as a modeling community, we have to really pay attention to model validation.

Again regarding the bias in the low values in DHS and the generally lower performance of the model at DHS: You explained it nicely in your response but didn’t change anything in the manuscript it seems. This is important information to convey to the reader and to strengthen the confidence in the model. For instance, you mentioned in your response:

For example, as reported by Wang et al., (2006), the low observed values of CO₂ flux are mainly caused by a CO₂ leak during the nighttime at the DHS station. In addition, the effect of topography also led to generally low fluxes in the southerly direction at DHS site (Li et al., 2021).

But this information did not make it in the manuscript. Just a short remark in the caption of Fig 2 or in the main text would be helpful.

Performance of GPP: Thanks, you provide me with some answers that make sense. Especially that the LUE products will have lower GPP due to missing CO₂ fertilization makes a lot of sense.

I think you should condense the new text. For instance, of course two different satellite products will lead to different GPP estimates. Also regarding the lines 321-329. It suffices that you mention that a likely reason for the higher estimation compared to VPM and EC-LUE is the missing CO₂-fertilization in the light use efficiency based models. No need for 8 lines.

I would however be interested: NIRv is sometimes really much lower than the rest. Can you find a possible explanation for this? It can't be missing CO₂-fertilization, since it is satellites. For ENF for instance, the NIRv value is half that of BEPS. I agree that you are interested in trends, but still, it is really important to thoroughly address model/data differences.

l. 332: Should be "The *simulated* forest GPP". Please also mention that you used the S_baseline for this.

l. 366-368: unclear.

l. 377: But Fig 5 shows that CO₂ is the main factor?

l. 413 grammar, verb is missing?

Discussion:

l. 427: "have the highest carbon sequestration rate under the background of global change". Needs to be clarified. I don't know what you mean here.

l. 439: Again the point about cropland being potentially more productive. The added phrase does not really back your claim. What was the GPP per area in that cropland before? What is it now? The "0.16TgC" increase does not really help me. I want to understand what the GPP was in that area, so I can interpret that value, whether this cropland was simply low in production before it was converted.

l. 446: interesting, so here a change from ENF to MXF and cropland leads to a decrease in GPP. But again, I want to know why that could be? Why are MXF less productive than ENF in those regions where the FCC happened?

Section 4.1.2: This section is very nice now, discussing why the different CC effects can have positive and negative effects and relating it to your findings. Well done.

l. 502: LAI the dominant contributor? Second-dominant, no?

l. 515: I appreciate the connection of GPP, NPP and carbon uptake. This is important to understand the implications of your study in terms of carbon uptake.

Section 4.1.4: This is very introduction-y, and not what I meant in my previous review. I mean, yes, CO₂ fertilization enhances GPP. But in your first version you linked that to C sequestration. That's ok but then you need to discuss also what happens to respiration in the meantime, what happens to tree mortality, and tree longevity. There are numerous uncertainties between CO₂ fertilization effect and the carbon sink. That's what was missing. Not re-iterating the relevance of GPP.

I apologize if my review comment was not clear here.

Also, I would say that the statement “The carbon sequestered by vegetation through photosynthesis in a given unit of space and time, i.e., GPP” is not correct, because it ignores respiration.

Finally, I think it makes much more sense to measure everything per m² as you do now. The only problem: The total impacts are now not in the paper anymore. I think you should conclude the discussion with a short section on the total impact in Tg/year, and discuss the briefly discuss the total changes in areas, LAI and so forth.