

Replies to the comments for the second revision

We thank the reviewers for reasonable and useful comments and try to reply below to the latest requests.

Methods:

Concerning the description of the vegetation index, I have two comments:

1. In the response letter, you say that you have added a reference by Govindasamy et al. to section 2.2. I was not able to find this reference, so please make sure to include it.

*- We are sorry, this was forgotten in the last revision. Now we found a different reference that includes measurements with better comparable methods (Shepherd et al. 2018). (Line 127+list of references)*

2. I also asked you to further clarify, how the green canopy responds better to photosynthesis. I do not think "it likely responds better to photosynthesis" is a sufficient clarification. I am sure you are correct here but please provide some concrete justification for this.

*- The text was revised as: In 2022, we measured green canopy cover with the Canopeo app (Patrignani and Ochsner, 2015) instead of LAI. Based on our experiences, and due to the operation and physical design of the LAI device, it did not provide as comprehensive picture of the biomass inside the gas measurement collar as Canopeo. Vegetation index has been found to be faster to measure and less dependent on the ambient light conditions than the light interception method (Shepherd et al. 2018). (Line 123)*

I think the flux modelling is now better explained. However, I had mentioned that I would typically expect to see some kind of estimation between modelled and measured fluxes to understand the uncertainty. You hadn't replied anything to this comment, so I raise it again here. If you don't think it's necessary to provide this, I'd at least appreciate an explanation in a response letter.

- *Figure S1 provides the comparisons between modelled and estimated GP and ER. There are also the measurement points of ER added to Fig. 1, so that the reader can compare the modelled and measured values. We are sorry for not stating this out in our previous reply.*

Concerning references to the FMI weather station and global radiation data set: I don't think a Creative Commons license means that a citation is not needed, it should only mean that the data can be freely used (with appropriate credits to the author/data provider).

Additionally, I do think it's also useful to provide the information of which FMI weather station was used.

- *The name of the weather station was added (Line 111) and the reference to FMI open data as well (Line 111+list of references).*

Results:

Concerning this comment from last round:

"L350: I would really prefer to see similar figures to Fig 2 from both crop vs. CH4 and year vs. CH4 although this can easily be put to the appendix (and combined as well). With such a low n-value, I don't think it's sufficient to say that these had no effect on CH4 fluxes only based on the p-value, particularly when in table 3, there does seem to be a clear relationship between CH4 and year. There is such a strong change during the years from a sink to a source that a very simple statistics might not capture the relationship but it doesn't mean it's not worth showing. I would also like to see some other metrics for measuring the relationship between these variables besides p-value. The same applies to the N2O fluxes where there are relationships between the variables but only the p-value is given. Fig 3 does provide some of this information but it is very difficult to read and to distinguish differences particularly between the vegetation options."

I appreciate the boxplot in supplements. However, I don't think the table S4 is very useful as it is in providing information about the linear effect models. It is very difficult to interpret as there is no additional information given about the variables in the table and it isn't linked in any way to the primary text. As I stated previously, I'm not convinced of the usefulness of only providing p value, so I think a little more analysis of the results of the linear mixed models would help the readers.

- *It was not very clear if the reviewer recommended deleting Table S4 or adding information to it. We added the information if the dependent variable was log-transformed or not in Table S4 to facilitate further use of the results e.g. for building equations based on the effect values. We also improved the explanation in the methods section on building of the models (Line 286). There would not be much relevant information added if the whole result set of each model was added in the supplement as the technical issues are explained in the methods, thus we hope that this solution is satisfactory.*
- *We have now linked table S4 better to the text by adding references to the table in the text (Starting line 326), with some additional aspects that can be said based on the mixed model analyses. It is true that the models or variables are not explained in the table but the model building process and method to acquire the values is described in the methods and we added in the description of statistical methods also the principle that all relevant variables were first included and then one by one removed if they were not significant.*
- *The largest change was done to the description of the mixed model for GP, ER and NECB as in their case we noticed that the effect of WTD was actually misleading in the*

*models that were originally selected. The previous model suggested that raise in WTD increases these variables, but the increasing trend likely resulted only from an increase of biomass as the experiment aged. It is now explained in the text that a mixed model without WTD is better (also based on the Akaike's information criteria). The effect of WTD on the most relevant variables, the gas fluxes, is illustrated in figures 2 and S2 separately.*

- *In the case of soil respiration, figures 2 and S2 provide the best information on the effect of WTD but we added more detail on the effect of crop type on respiration (Line 371).*
- *In the case of methane and nitrous oxide, we added references to Fig S3-S4 and Table S4 which should make it easier to understand the results.*

Finally, a couple things about your response in general: Reviewing the modifications that you made would have been considerably easier, had you included the line numbers of where each modification was done in your author response. Furthermore, please make sure that the tracked-changes -version corresponds with the original manuscript. Now, lines 196-200 appeared out of nowhere to the new version which didn't exactly help.

- *We are sorry for the sloppy work! We tried to be more careful in this round.*

*Some typos were corrected and some additional improvements made:*

- *Line 236: Two sentences on soil respiration estimation were added.*
- *Line 265: Reference to Matlab was added.*
- *Table S3 was revised as there were results of 2 alternative model parametrizations. Now only the final version remains.*