**General comments**

This paper presents the effect of different groundwater levels on GHG emissions in the case of bare soils vs cultivated soils (poplar + *F. ovina*). The experimental design is smart, and the semi-controlled conditions allow for precise adjustment of the groundwater levels which of course wouldn't be possible in an open environment.

The results show that even for tree species that benefit from high water content, water-saturated soils (groundwater level at -2 cm especially) prevent efficient growth of the vegetation. Also, high groundwater levels reduce $CO_2$ emissions but enhance $CH_4$ emissions through anaerobic processes.

Although I acknowledge the difficulty of conducting long term experiments and managing the material aspect (need for space, etc.), the lack of replicates may be an issue, as well as the short duration of the experiment (less than 3 months), especially to derive long term trends.

However, while not perfect, the experiment and manuscript still give a great insight in the way the plants and environmental conditions interact and generate GHG, especially in the context of worldwide peatlands degradation.

**Specific comments**

L84: 'Water regulation system was installed inside each of the five hydroisolated boxes at four different levels depending on the depth from the soil surface: -2 cm, -15 cm, -25 cm, and -35 cm' → so, out of the five boxes, there was one at -2 cm, one at -15 cm, one at -25 cm and one at -35 cm? Was the fifth one a control box? If so, please write it. Sorry if I'm misunderstanding something here.

Answer: In this study, only four boxes were included in the analysis, corresponding to predefined water table depths (−2 cm, −15 cm, −25 cm, and −35 cm from the soil surface). Additionally, one control box at −2 cm was established, containing both mineral soil and peat, which were the substrates used in the other experimental boxes. This information has now been included in the Methods section, and emission values from the control box have also been added (Lines 98-99, 102-103, 117-119, 485-492).

L137: why not monitor temperature all along the experiment? Same for chlorophyll.

Answer: We did monitor air temperature and moisture throughout the experiment. We did not have the possibility to monitor soil temperature continuously, as our chosen method was removable temperature plugs, which needed to be removed from the soil in the greenhouse

and read in the laboratory. Therefore, we decided to monitor soil temperature only during the periods when we had the opportunity to carry out GHG analysis. This was also limited by the project finances as well as the delivery of nitrogen gas needed for GHG measurements. Our primary reason for gathering soil temperature data was to use it in GHG calculations. The same applied to chlorophyll, we carried out as many repetitions as possible with these measurements.

L177: why '1/Date' (and not just 'Date')?

Answer: The model includes Date as a random effect, however, the brackets were excluded in the text by mistake. The notation has been corrected to (1 | Date) (Lines 210-218).

L205: the -2 cm trees did not show any root development? Also, did you correct the below-ground biomass with the mass of the stems you planted at t=0? If not, did you make sure all stems were initially around the same width and mass?

Answer: We planted bareroot stem cuttings with only initiation of root nods (one week in water). We did select the around same size cuttings for experiment. However, there was some error, as it was hard to collect them identically, we now will acknowledge this in method section (Line 129).

L207: the sentence seems unclear to me, as I would interpret 'shallow' as -2 cm. However, given your statement, I suppose it rather refers to -35 cm. Please clarify this, at least once, so that you can then use shallow without risking misinterpretation. Also, accumulation does not only depend on biomass production but also on biomass degradation...which might be lower in -2 cm (water-saturated environment) than in -35 cm conditions.

Answer: Thank you for your comment, we see, that we need to indicate more precisely in the method section. Our drainage graduation was based mainly on methane emissions. Previous studies show that they increase drastically when water table exceeds 25-20 cm belowground, therefore, we used this to determine the depth of the drainage – deep drainage – Very low $CH_4$ emissions expected (-35 cm), shallow drainage – increase of $CH_4$ emission expected (-15 and -25 cm), no drainage – very high $CH_4$ emission expected (-2 cm). In this sentence it was actually meant -35 cm, as the average trend was more productive in all parameters, but did not show significant differences. We corrected this in the text (Line Line 241). We also include now our gradation in the method sections (Lines 97-98).

L223: To me, 'high weekly variability' means that there is a weekly pattern with high variability along the week. I suppose you rather mean it varies greatly along the weeks, from one measurement to the other. If so, this sentence may need rephrasing. You should also rephrase the caption of Figure 4 the same way.

Answer: Thank you for comment, we did indeed mean that it varies between different weeks, we rephrase this sentence (Lines 263, 280)

L231: what do you mean by 'the most important' and 'the most significant'? The days with the highest chlorophyll concentrations? If so, this may not be the most adequate wording.

Answer: We agree, that this is not adequate wording, we rephrase sentences, as this was meant, when the peak concentrations of Chl A and Chl B were observed (Lines 271-274).

L238: 'on soil respiration depth'? I don't think 'depth' belongs here, does it?

Answer: We excluded 'depth' form subtitle (Line 283)

L327: is 'per year' a good unit as you are specifically talking about huge differences in GHG emissions from one month to the other? While the overall conclusion will be the same, wouldn't 'per month' or 'per day' make more sense?

Answer: Thank you for your comment. We agree that your suggestion would be logical from the perspective of this manuscript. We firstly chose to express emissions on a per-year basis despite measurements being conducted only over a two-month period, because this is the standard unit used in greenhouse gas studies. Using this convention facilitates comparison with other published results. However, we also were aware that this could be useless comparison taking in mind that this may be a large overestimation due to the measurements only during active vegetation period. We decided to calculate and redraw our figures to per day calculations (Lines 298-305, 326-329). We also wrote addition paragraph in discussion section acknowledging this issue (Lines 453-458)

L353: diurnal or daily?

Answer: Thank you for your questions. For the listed factors, variability occurs at both daily and diurnal scales. Here, we emphasized diurnal variability as a reference for the differences we found, shown in Figure 5, between daytime and nighttime hours.

The whole discussion section might benefit from slight changes, such as adding subsections with clear titles, to help structure the reflection and guide the reader along.

Answer: Thank you for your comment, we now included similar subsections as for result section, adding additions in the end of the discussion section where we talked about experimental design, greenhouse conditions, and implications for future climate scenarios (Lines 348, 390, 435)

**Technical corrections**

All along: please be careful with overall English, punctuation and wording: some sentences are unclear, and many would be improved with (adequate) use of commas. The sentences tend to be long. Also, the way you introduce statistical results and p-values along the text may benefit from a change. It lacks punctuation between the different groundwater levels, and globally lowers the readability of the text where it is introduced.

Answer: We went throughout the text and carefully edited vocabulary and grammar. Also, we change the way of introducing statistics, moving them to the tables of Appendix section.

L31: 'decreasing $CH_4$' I guess.

Answer: Edited (Line 35)

L33: 'Although these are the main threats after peat drainage, recent studies show that whether the ecosystem on organic soil acts as a carbon source or sink is significantly determined by local environmental conditions, vegetation, land use, chemical and physical properties [...]' → to me it feels a bit strange to put 'land use' in this list, as you are precisely explaining before that peat drainage is a problem, and I interpret peat drainage as a land use change in itself.

Answer: We agree on this, by this we meant current and/or previous ecosystem on peat soil (etc. peatland, peatland forest, agriculture), but this can also attribute to already listed factors as vegetation and the history of peat accumulation, therefore we decided to exclude land use (Line 40).

L83–84: typo (×3): 'from', not 'form'. Same L140 (×1) and 141 (×1).

Answer: Edited (Lines 93-94, 171)

L101: 'kg' not needed (it is a ratio).

Answer: Excluded (Line 115)

L109: '-1' in superscript (×2).

Answer: Edited (Line 126)

L140–142: the sentence is unclear, please rephrase. Also, what does CCI stand for?

Answer: Thank you for suggestion. We agree that this sentence may be hard to understand, maybe also because of its length. Therefore, we separated it in three distinct sentences, which we also rephrased (169-173). We now indicated in the text when first mentioned, that CCI refers to Chlorophyll Content Index (Line 169).

L194–197: This is already visible on the figure as you indicated significant differences with different letters. I suppose you want to emphasize that it is even smaller than 0.05, but I don't think it's needed. If you want to keep it, I would advise to find another way to present these statistical results (a table?).

Answer: We agree that this is a lengthy way to show statistics, and its not needed, when we already showed same results in figure. We excluded them here and also in similar situations throughout the paper. We have now created tables for statistically significance results (527-545).

L206: in Figure 2, '-2 cm' suddenly turned into -5 cm on the figure. Please correct all the occurrences.

Answer: We edited Figure 2 and Figure 4, where older version was left. We were firstly planned to regulate water table in height of -5 cm, but later after establishing experiment, it was seen that water table for this group was higher, respectively, -2 cm, therefore, we corrected this group (Lines 245, 280).

L227–230: I would advise to find another way to present these statistical results (a table?).

Answer: Thank you for suggestion, we added 5 tables in Appendix section, at the end of paragraph, with statistically significant differences, that previously were displayed in brackets (527-545). In the main text we now only reference these tables (Lines 235, 239, 251, 253, 268, 290, 291)

L247: 'Nevertheless, the regression analyses showed [...]' → Unclear, probably lacks punctuation.

Answer: Thank you for your comment, we separated this sentence in two to increase readability (Line 293-294).

L249: '10000 kg c' → '10000 kg C'.

Answer: Edited (Line 294)

L289: 'with for' → please correct.

Answer: 'for' excluded (Line 358)

L321: remove 'are', or make two different sentences.

Answer: Removed (Line 393)

L333: grammar → 'the vegetation negatively influences', or 'the vegetation negative influence on'

Answer: included ‘on’ (Line 407)

L345: 'in advance'? I don’t understand.

Answer: Edited to “In addition” (Line 431)