

# ***Interactive comment on “Impact of water table level on annual carbon and greenhouse gas balances of a restored peat extraction area” by J. Järveoja et al.***

**J. Järveoja et al.**

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We thank Referee #2 for the constructive comments and suggestions. The following revisions will be made in response to each of the comments (page and line numbers refer to the pdf version of the Discussion paper):

**REVIEWER 2:**

**General Comments**

This manuscript describes the results of a study that captured year-round greenhouse gas (GHG) emissions from a restored peatland in Estonia, subject to different levels of

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post-extraction restoration treatments and including N<sub>2</sub>O, a GHG that has previously been rarely evaluated in similar ecosystems. The topic, research questions, and experimental design are clearly explained, the results are interesting and presented well, and the discussion includes reasonable analysis and comparison to other, related studies. Overall, this manuscript is of high quality and I think it meets the criteria for publication in Biogeosciences.

#### Specific Comments

The measurement of autotrophic respiration for a chamber position (Ra) is accomplished by subtracting the heterotrophic respiration (Rh) as measured at an adjacent chamber cleared of vegetation (pg 10, Section 2.5). This assumes no root contribution to the cleared chamber, though vegetation cover at the two restored sites includes shrubs and small trees that may have roots that spread horizontally below ground. Was the absence of roots that might have contributed to unmeasured autotrophic respiration at cleared chambers confirmed? When those heterotrophic-only plots were cleared, were the roots of vascular plants removed?

Response: We did not manually remove (i.e. pick out) roots from inside the cleared plots to avoid disturbance to the soil column. However, when establishing the heterotrophic respiration plots, the soil and lateral roots were cut with a sharp knife to a depth of 30 cm around the collar to exclude the contribution of vascular plant root respiration within the cleared plot area. We have clarified this in the Material and methods section of the revised manuscript 'The soil around the Rh collars was cut with a sharp knife to a depth of 30 cm in April 2014 to exclude respiration from the roots.' (P17186 L21). Also, when comparing the heterotrophic respiration data from Res-L (drier) and Res-H (wetter) there is no significant difference between the fluxes although in the drier plots the cover percentage of vascular plants was significantly higher compared to the wetter plots which in that case could have also resulted in higher heterotrophic respiration. We would also like to stress and clarify that the presence of vascular plants at our restored site was rather small (<4 and <14% area cover in Res-H and Res-L,

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respectively) and the maximum height of shrubs and tree seedlings was  $\sim$ 5 cm. Thus, the effect from initial decomposition of the trenched lateral roots on Rh measurements was also likely to be negligible.

**Scientific significance:** Does the manuscript represent a substantial contribution to scientific progress within the scope of Biogeosciences (substantial new concepts, ideas, methods, or data)?

Yes. The manuscript presents results covering full-year net emissions of the three major biogenic greenhouse gases, CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O across a restored peatland with different restoration treatments. This represents interesting and useful new data because most previous studies in similar systems have not included full-year measurements, and few previous studies have measured N<sub>2</sub>O in peatlands.

**Scientific quality:** Are the scientific approach and applied methods valid? Are the results discussed in an appropriate and balanced way (consideration of related work, including appropriate references)?

Yes. The objectives and methods are well described and clearly related. The results are fairly interpreted and discussed, with appropriate reference to related work.

**Presentation quality:** Are the scientific results and conclusions presented in a clear, concise, and well-structured way (number and quality of figures/tables, appropriate use of English language)?

Yes. Figures and tables are clear and well-designed. English-language use is good, with a few minor corrections (see below)

#### Technical Corrections

Many of these corrections are suggestions to improve – in this reviewer's opinion – the readability of the text, rather than errors per se.

Pg 6 L15: the wording is awkward: "A section in the size of approximately 0.24 ha

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within" ... Better might be: "A section approximately 0.24 ha in size within" ...

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Response: We incorporated the reviewer's suggestion and rephrased the sentence as 'A section approximately 0.24 ha in size within the abandoned site was restored in April 2012.' (P17182 L15-16).

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Pg 6 L17 – "aiming" is in present tense, but the rest of sentence is in past tense – "aimed"

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Response: Accepted, 'aiming' has been replaced by 'aimed' (P17182 L17).

Pg 8 L10 "In addition" Pg 8 L13 "In addition" Two sequential sentences start this way.

Response: We have deleted the first occurrence of 'In addition' (P17184 L10).

Pg 9 L5 "accuracy" perhaps should be "precision"

Response: We have modified the text to read as follows 'In each collar, the cover was estimated visually for each species and rounded to the nearest 1 %.' (P17185 L4-5).

Pg 9 L16 & L26 – model / manufacturer information for IRGA should immediately follow first statement of "IRGA"

Response: We incorporated the reviewer's suggestion and moved the model/manufacturer information to the first sentence mentioning the IRGA (P17185 L16&26).

Pg 10 L21 – change "was cleared from living" to "was cleared of living"

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Response: Accepted, 'was cleared from living' has been replaced by 'was cleared of living' (P17186 L21).

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Pg 21 L27: "Further noteworthy" could be changed to "Also of note", "Also noteworthy", or "Furthermore" (and remove "is that")

Response: Accepted, 'Further noteworthy' has been replaced by 'Also noteworthy' (P17197 L27).

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Pg 22 L3: “could considerable increase” to “could considerably increase”

Response: We have corrected this typo in the revised manuscript (P17198 L3).

Pg 24 L13/14: insert word “the” before “few”

Response: We have added ‘the’ before ‘few’ (P17200 L14).

Pg 24 Ln15: remove “that”

Response: We have corrected this mistake in the revised manuscript (P17200 L15).

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