

Dear editor,

we want to thank you and both reviewers for the time and helpful comments. We were not able to conduct language revision by a professional native speaker in short notice. We carefully checked the text throughout by the author team. In addition, we understood that BG applies English language copy-editing before producing the galley proofs. Please, let us know if the language edition is still needed. Below, see our point-by-point responses to the reviewers' comments. We are submitting hereby our revised manuscript (track-changes and a changes-accepted copies). Please, note that the line numbers are not matching in the two versions because of the extra lines in the track-changes copy.

Sincerely,

Sari Juutinen on behalf of all authors

#### **Anonymous referee #2**

The authors have incorporated most suggestions of the first round of reviews into their manuscript as far as the study design / data set allows.

Especially the revised parts of the manuscript now require a language revision since they contain quite some grammar and spelling mistakes.

For example:

- I. 40 remove "a" in front of "NEE800 and Pg800"
- I. 42 remove one "and"
- I. 43 "...the dominant source..."
- I. 190 "standard gas" ?
- I. 354 "...equally high emissions as the fens..."
- I. 503 "nevertheless"

I would suggest a proof-reading of the manuscript by an English native speaker.

[A: We did a language editing of the text incl. the text in the above-mentioned cases. There are many small editorial changes \(see the track-change copy\).](#)

## Anonymous referee #1

The authors have carefully addressed most of my comments and provide a much improved manuscript version. I do have a few minor comments remaining that I would ask the authors to consider in their final version.

1) the reviewer response states that CH<sub>4</sub> flux in barren and all the consuming LCTs was revised and were 6% - 8% of emissions. The modified manuscript text reports 9%. Which one is correct?

2) I remain skeptical if reporting the contribution of CH<sub>4</sub> consumption vs. emissions is meaningful considering it is based on such few spatially distributed points (1-2 according to table 1 except for fens and bogs). The authors acknowledge this which I appreciate, but I would encourage them to briefly mention also the following points in the discussion or conclusion:

- seasonal bias of measurements: most measurements are from peak summer and the later half of the growing season (higher temperatures, deeper thaw, active vegetation). I would expect this to result in higher CH<sub>4</sub> emissions (also due to plant CH<sub>4</sub> transport) but also higher rates of CH<sub>4</sub> consumption compared to spring and early summer (lower temperature, shallow thaw, higher soil moisture). Therefore, it would seem to me the reported estimate is the maximum summer contribution of consumption vs. emissions.

- importance of temperature on all gases could be briefly mentioned, even though it is not included in the DCA (not consistently measured).

A: There's variation in the percentage value due to what area was in the focus (barren only, lichen tundra, or all LCTs that consumed CH<sub>4</sub>). As suggested, we edited the text in the abstract, results and discussion to specify that the estimates represent only growing season. Our chamber data showed large consumption of atmospheric CH<sub>4</sub> in tundra barrens and that is supported by the EC data and analysis by Tuovinen et al. (2019). The high rate can be a local feature and related to soil and parent material characteristics.

3) Throughout: please provide number of n when reporting standard error. Otherwise report standard deviation. Since fluxes, especially of CH<sub>4</sub> display a high variability, I recommend adding the median, as well as upper and lower quartiles. Reporting only means may overestimate fluxes in this case.

A: We replaced the Table 3 with more through table giving LCT means, medians and standard deviations based on collar specific estimates of Pg<sub>800</sub>, ER, NEE<sub>800</sub> and collar-specific temporal means of CH<sub>4</sub>. Those were used to calculate the spatially weighted average CO<sub>2</sub> and CH<sub>4</sub> fluxes for the landscape (35.8 km<sup>2</sup>) and proportions of each LCT in it (%). The current table consists also LCT specific means, medians, and standard deviations for CH<sub>4</sub> measured during all study years. We ended to the extended table to avoid massive amounts of data figures in the text. The text is edited accordingly. Due to the editions in the Table 3, we edited the table 2 by removing number of observation points (Now in the Table 3). Table 3 is referred in the figure legends when appropriate.