

**Egusphere-2024-3813:** Long-term nitrogen fertilization alters microbial respiration sensitivity to temperature and moisture, potentially enhancing soil carbon retention in a boreal Scots pine forest

Boris Ľupek et al.

**Reply to editor Kees Jan van Groenigen (on technical comment)**

Dear authors, thank you for sending this revised version. As the concerns raised by both reviewers have been addressed, this manuscript can now be accepted for publication. I recommend "technical corrections", because one line in the newly added text could use some adjustments:

"The estimated net GHG mitigation of  $-327.6 \text{ g CO}_2 \text{ m}^{-2} \text{ yr}^{-1}$  based on Rh/SOC model outputs from a three-year period provides a first-order approximation. However, this estimate likely underrepresents the full climate impact of fertilization, as it does not account for longer-term dynamics or potential offsite carbon and nitrogen losses, such as leaching, indirect emissions, or biodiversity-related feedback. Therefore, broader system-level assessments over longer time scales are needed to confirm these findings."

"However, this estimate.... feedback." is problematic, as "underrepresents" suggests that the GHG mitigation due to N addition is underestimated in this study. The opposite seems much more likely; all the processes you list would decrease the climate benefit. As such, I suggest you change "likely underrepresents the full climate impact" to "This estimate does not fully capture the climate impact of fertilization, as...".

May I also ask you to take into account the notification from the review file validation process? Please place sections "Acknowledgements", "Data and code availability", "Author contribution" and "Competing interests" before the reference list. The manuscript structure should follow the guidelines as described at <https://www.biogeosciences.net/submission.html#manuscriptcomposition>

all the best,

Kees Jan van Groenigen

*Dear Editor,*

*thank you for reviewing the revised manuscript and for your insightful suggestion regarding the phrasing of N fertilization impacts.*

*We agree with the comment and reformulate the sentence (L415):*

***“However, this estimate does not fully capture the climate impact of fertilization, as it does not account for longer-term dynamics or potential offsite C and N losses, such as leaching, indirect emissions, or biodiversity-related feedback.***

*We also placed sections "Acknowledgements", "Data and code availability", "Author contribution" and "Competing interests" before the reference list.*

*Kind regards,*

*Boris Tupek*