

Title: Quantifying rhizosphere priming effects on soil organic matter decomposition
in situ in a subarctic ecotone using natural abundance radiocarbon

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We appreciate the comments from the two reviewers. In this revised manuscript, we have implemented the suggested changes and we have addressed all the comments below. We would like to acknowledge the inputs of the reviewers which have improved the manuscript.

RC1 Comments:

"In this study, the authors used 2700-year-old peat cores to study rhizosphere priming in the subarctic in willow and birch communities. The study was carefully done, although like many radiocarbon studies, sample sizes are small. The use of fine-mesh cores to exclude mycorrhizal fungi allowed the contribution of new photosynthate versus old peat to be roughly assessed. This approach was complemented by concurrent girdling of source shrubs/trees (willow/birch) in the experiment. These mesh cores allowed rhizosphere priming effects to be assessed, with an overall effect of 1.36, or 36% more CO₂ flux from cores with the rhizosphere connections present than with those connections not present. It was surprising that girdling of willow or birch had very little effect on the measured CO₂ fluxes.

The paper would be improved particularly by focusing on the figures. Figure 1, the schematic, was very good, others could be easily improved. Figure information should ideally not be lost if printed in black and white, as I did. For example, in Figure 2, 2a and 2b should be labeled clearly as birch, 2c and 2d labeled clearly as willow. Similarly, lines in Figures 2b and 2d indicating ¹⁴C of atmospheric CO₂ and peat-derived CO₂ should not require color. Just label the lines. Similar improvements could be done to Figure 3. For Figure 4, perhaps the left four columns could be labeled birch and the right 4 labeled willow."

Thank you for the comments and suggestions. We have modified figures to more clearly identify birch and willow plots by including the vegetation type in plot panels. Additionally, we have labelled the peat and atmospheric end members in Figure 2.

1. 258, 259, 260. ¹⁴CO₂ signatures are not enriched, they are higher or lower.

We have changed this according to both reviewer requests in several places across the manuscript, making this terminology consistent and clearer than before. For example, in the Results section it now reads:

"Slightly ~~more enriched~~ higher ¹⁴CO₂ signatures were observed in respiration from peat cores in girdled plots..., compared with ungirdled controls, although these were

neither significant in birch ($p = 0.104$) nor in willow ($p = 0.172$) (Fig. 2b & d; Table B1)."

AND

"¹⁴CO₂ signatures ~~were also enriched~~ increased by 5.3% modern on average in the birch ingrowth cores ($p = 0.005$, Fig. 2b) and by 7.7% modern in the willow ingrowth cores ($p = 0.001$, Fig. 2d) relative to the exclusion cores in the control treatments (Fig. 2b-d; Table B1)"

2. 378. 'extraradical' is preferred to 'extramatrical'.

This has been changed in the text to: "Furthermore, saprotrophs and mycorrhizal fungi exhibit distinct vertical niche differentiation (Rosling et al., 2003), and ectomycorrhizal species may even associate with roots at different depths than those at which they produce their ~~extramatrical~~ extraradical mycelium (Genney et al., 2006)."

General. Equal, etc.s signs ($=$, $<$, $>$) should have adjoining spaces, these are mathematical sentences.

Spaces have been added between equal signs in all equations in the main text (1-5), which makes them easier to read.

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