

## ***Interactive comment on “Sudden cold temperature regulates the time-lag between plant CO<sub>2</sub> uptake and release” by M. Barthel et al.***

**Anonymous Referee #1**

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This paper used a <sup>13</sup>CO<sub>2</sub> pulse-chase labelling experiment to investigate how the sudden temperature change from 25°C to 10 °C on the short term regulates plant CO<sub>2</sub> uptake and release. The authors demonstrated that plants exposed to a sudden temperature decrease delay the C transport from above to belowground and invest more C into root biomass and plant respiration.

Overall, I feel this is important work exploring the role of temperature as environmental driver for C cycling between above and below ground. The authors clearly have a strong grasp of experimental work and the methods and analyses they use are appropriate and, I would argue, quite clever in some cases. Their multifaceted approach is very welcome and provides a stronger case for their argument. In short, I would like to see this work in print.

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I have only some comments that authors may consider to increase the readability and impact of the manuscript. Major comments are: 1) I would add in the introduction the reasons why the authors decided to perform the experiment at 25°C and 10 °C and the relevance of the study in relation to the “state of art”. 2) Objectives as presented in page 17942 lines 23-28 are too general. I think that a list of more specific objectives, including specific hypothesis for each one may be very helpful for readers. Thereafter methods section (that include a long set of details) may be also organized in accordance to such more specific hypothesis. Similarly, results section may be organics in accordance to such hypothesis. 3) In method section page 17945 lines 4-9 it is not easy to understand the AS,NB ratio: what is 0.00111802 and how the authors calculate the carbon fraction (fc)? 4) In the Discussion section is missing a critical comment on the short duration of the experiment and on the fact that this experimental temperature drop from 25°C to 10 °C is difficult to be realized in natural condition. I would invite the authors to comments on the limit of their experimental design and how/if their hypotheses could change in natural conditions.

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