

Interactive comment on “Sudden cold temperature regulates the time-lag between plant CO₂ uptake and release” by M. Barthel et al.

Anonymous Referee #2

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This paper describes a ¹³CO₂ pulse-labelling laboratory experiment designed to investigate the effect of temperature on short-term coupling between C-uptake and respiratory loss. The authors make a clear case for the novelty of this work, and thoroughly describe the findings of relevant previous studies. Methods are well-supported by preliminary research, provide a comprehensive approach and are appropriate to the question. The study showed a delay in transport/use of recent assimilates below-ground at the colder temperature, and increased relative investment in respiration.

Overall, the work makes a valuable contribution to the field and I would like to see it published. However, the quality of the manuscript could be significantly improved by some modification of the structure, and the impact enhanced by adding consideration of how the experimental findings relate to field situations, and what future enquiries are

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needed in response to the findings presented here.

General comments

p 17941 line 26 – 17942 line 13: need to state more clearly the importance of understanding both single-factor responses and interactions

p 17942 line 20: briefly explain the experimental approach – explaining the shift in temperature is to avoid acclimation and justifying the selection of the 25oC/10oC range

p17942, line 27: ‘biological and physical processes’ seems vague - an explanatory sentence detailing these processes would link the introduction more clearly to the later discussions. Also, the single hypothesis stated here relates only to transport time, when the experiment actually had a somewhat broader scope (e.g. line 20). I would suggest defining additional objectives and focusing on these to create a clearer structure for subsequent sections.

The methods section would benefit from a reduction in length. Methodological details could be described more succinctly throughout, and authors could also consider moving more findings from preliminary investigations to the supplementary section (e.g. Fig 1, p17945 lines 19-23).

p 17947, lines 5-9: what is the relevance of this information?

p17954, lines 9-25: it would be interesting here to have comment on whether/why the authors feel that an allocation response to temperature would be the same as that shown in drought and shading studies

Since this is a short-term growth chamber experiment, it would be very valuable to include comment on how the findings might differ in field situations and also briefly identify the key outstanding questions in relation to the influence of temperature on short-term C cycling in plants.

Technical comments

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p 17948, line 18: state abbreviation again in words for clarity

p17953, line 1: the possibility of hydraulic adaptations is hypothetical, so should be stated as “would represent an underestimate. . .”

Interactive comment on Biogeosciences Discuss., 10, 17939, 2013.

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