

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

**M. Barthel et al.**

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Response to comments by Referee 1

We thank anonymous Referee 1 for this positive and constructive review. The referees contributions have strengthened our paper and improved its overall quality and impact. Please find below our respective responses to the specific comments, suggestions and corrections (our replies start with #).

"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

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welcome and provides a stronger case for their argument. In short, I would like to see this work in print. 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”. # We have now incorporated a paragraph about the treatment selection, both in the Introduction and in more detail in the Methods sections. “The temperature treatments were chosen to cover a range of realistic climatic conditions in pasture-growing regions, and with the expectation of a treatment effect. While perhaps uncommon in more continental areas, a 15 °C difference in temperature from one day to the next is a recurring event in highly changeable, oceanic climates. For example, in the agricultural region of Canterbury, New Zealand, on average every year there are more than ten occasions when the difference in daily maximum temperatures between subsequent days exceeds 10 °C, and one occasion where this difference exceeds 14 °C (Lincoln Broadfield weather station, 1999-2013, data available from [www.cliflo.niwa.co.nz](http://www.cliflo.niwa.co.nz)).” In the Introduction we clearly illustrate the state of the art concerning the study of environmental drivers affecting plant C cycling.

2) Objectives are too general, specific hypotheses for each objective would be helpful for reader. Methods and Results sections then re-organised accordingly. # We have incorporated specific hypotheses and re-organised the following sections accordingly.

3) AS,NB ratio, what is 0.00111802 and how was the carbon fraction (fc) calculated: # We added ‘The value 0.0111802 denotes the isotopic ratio of the V-PDB standard (Werner and Brand, 2001). We have clarified that the carbon fraction (fc) stems from C content analyses of root and shoot samples.

4) Discussion needs to include comment on the short duration of the experiment and that the experimental temperature drop from 25 to 10°C is hard to realise in natural conditions. # In an oceanic climate, for example in New Zealand, such temperature

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drops are not that uncommon. See comment 1) above.

5) I would invite the authors to comments on the limit of their experimental design and how/if their hypotheses could change in natural conditions. # Done as suggested within the discussion section

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

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