

## ***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 #3**

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“Sudden cold temperature regulates the time-lag between plant CO<sub>2</sub> uptake and release” by Barthel et al. describes a laboratory experiment, which attempted to elucidate the effect of sudden cold snaps on the time it takes for labeled CO<sub>2</sub> to be cycled from above-ground to below-ground compartments of planted rye-grass. The authors found that sudden cooling of the above ground air caused an increase in transport time and plant respiration, and also reduced C storage in root biomass. The paper is relevant in its scope for BG readers and presents innovative analysis and data to an ongoing research area. The work was well written and following some minor changes and clarifications, I would recommend it for publication.

Additional comments:

1. I would recommend that the title be modified to reflect the full analysis conducted  
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(i.e. not just transport time, but also allocation). Perhaps something along the lines of: “Sudden cold temperatures prolong CO<sub>2</sub> transport between shoots and roots, increase respiration and decrease carbon accumulation in roots.”

2. The hypothesis/objectives should reflect your multiple analysis and results (i.e. transport and accumulation in tissues).
3. Please explain why you chose the 25C and 10C temperatures for your experiment (or a 15C reduction).
4. What was the daily radiation regime of the plants in each of the cabinets? This may be of interest for anyone interested in replicating your methods.
5. Please clarify in Figure 4, panels C and D, that “respiration [value]” is a fraction (“respiration” by itself suggests rate. Overall it is a very nice summarizing figure, although the changes in the root C-13-excess with time are a bit hard to differentiate due to scale.
6. please add units of tau to Table 1.
7. Why is there such a large gap in data collection in panel F and J (before 50hr and around 150 hours)?

Minor edits:

1. Line 20: change “to” to “too”, p.17950
2. Add comma after: “scale” on line 21, p.17950; “of respiration” line 3, p.17951; “time” on line 11, and line 23, “Fagus saplings” p.17953; “growth/storage”, line 7, “patterns” line 10, “grasslands” line 18, p.17954
3. Line 22, p.17954, “temperature drop. . .” to “temperature-drop”

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