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Biogeosciences Discussions

Interactive comment on "Response of δ^{13}C in plant and soil respiration to a water pulse" *by* Y. Salmon et al.

Anonymous Referee #2

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Salmon et al. attempts to better understand the link between photosynthesis and respiration, and the environmental drivers causing changes in the natural abundance 13C signature of respiration sources. To do this, the manuscript describes the response of the 13C signature of respiration (whole mesocosm, aboveground, and belowground including soil microbes) from beech saplings under a combination of experimental treatments (ungirdled, girdled, and at 3 temperatures) to a water pulse addition.

Overall, the manuscript is well written, clear, and provides excellent context in which the work fits into the large breadth of work on this subject. The results are interesting, however, I have a few major comments, one of which was highlighted by Reviewer #1.

First, regarding the beech saplings being placed in the dark for the 13C measurements following the water pulse addition. I understand the reasoning for this, to avoid respired

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CO2 to be assimilated, but I agree with Reviewer 1 that it may affect the results and interpretations, and there appears to be a disconnect between the physiological measurements taken under light conditions and the isotope measurements taken under dark conditions. With no photosynthesis, allocation of new assimilate supply is probably slowed/stopped. The effects of this are probably different for substrate use by above and below ground plant components, and particularly measurements that span from 2 to 72 hours after the water pulse, there could be large differences in C sources being used. This directly impacts the conclusions, and these treatment affects need be better reconciled in the methods, discussion and conclusions.

Second, the manuscript does not show the measured CO2 flux response in a figure. It is coarsely shown in Table 3, but it would really help the reader to see the pulses of respiration from the different components over time. This should be added, and would make the manuscript more quantitative. For example, does the isoflux of from above and belowground match the mesocosm isoflux? The authors should be able to quantify the contribution of autotrophic and heterotrophic respiration to soil respiration over time using the girdled and ungirdled treatments. How does the CO2 flux from microbes that receive fresh plant inputs differ from that of microbes with no root exudates? How is the CO2 flux/and isoflux timing different with plants and without plants?

Third, in the results it states that the SWC in the pots were maintained at 80% field capacity. However, in Table 1 - the girdled plot have much lower SWC than the ungirdled. This is also a treatment affect that needs to be addressed particularly for the microbial drought response.

Figure 1 should be improved to allow the reader to see the individual treatments. I suggest panels that share a y-axis instead of the x-axis, and this would be more intuitive anyway, because it is the size of the 13C shift that is highlighted not the temporal differences between the components.

Interactive comment on Biogeosciences Discuss., 8, 4493, 2011.