**Biogeosciences
Discussions**

Interactive
Comment

Interactive comment on "Decreased carbon limitation of litter respiration in a mortality-affected piñon-juniper woodland" *by* E. Berryman et al.

E. Berryman et al.

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Response to Referee 1 Comments

General Comments

This is a review of "Decreased carbon limitation of litter respiration in a mortalityaffected pinon-juniper woodland" by the authors Berryman et al. They used a combination of water and sucrose amendments to assess the degree of C limitation to soil respiration in litter and mineral soil in reference plots and experimental plots subjected to simulated tree mortality. Briefly, they found that widespread mortality may decrease labile C

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limitation of litter respiration in the first growing season following mortality. The authors use and innovative approach to separately analyze the effects of C and water availability on soil respiration. I thought it was interesting that there was a temporal component to C and water limitation in that the C response seemed to lag the water response in some cases. This supports the authors' conclusion that labile soil C may quickly be depleted following water pulses in dry ecosystems. However, I tend to think of this not as a substrate limitation, but rather a limitation in microbial access to substrate. Microbes are first limited by soil water content which controls substrate diffusion rates/distances. Once this water limitation is removed, only then will adding additional C have any effect on microbial activity. After all, if the authors had added C to soil with no water I don't think they would have seen much increase in respiration. I think that this is a subtle yet important point that the authors' may want to incorporate into their discussion.

Authors' response: Thank you for your thoughtful review, and we hope that we adequately addressed your concerns.

We did not intend to imply that respiration is substrate-limited in the absence of water; rather, substrate limitation is only important after a rain event, when water provides pathways for mobilization of substrate to mineralization sites. We agree that the response of respiration to water additions comes from the release of substrate and enhanced access to substrate that water provides. Our approach, which compares water-treated respiration to respiration following application of the same amount of water with sucrose added, separates the effects from pure water addition from the effects of additional substrate. Because respiration was further stimulated by the sucrose solution additions, in excess of the effect from water-only, we can conclude that respiration in this system is controlled first by water availability and then by labile C availability. We have taken your advice and incorporated these points into the first paragraph of the Discussion and in other key areas we have

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clarified and emphasized that labile C limitation only occurs following rain events.

Specific Comments

Hypothesis 2, page 14478: This seems to be a weak hypothesis to me. You identify water, substrate, and temperature as the three limitations to respiration. Doesn't it go without saying that if you remove two of those limitations (water and substrate), then respiration will be more limited by the last remaining factor (temperature)?

> Authors' response: We admit that it is not a compelling hypothesis and, because it is not the main focus of our paper, we have removed it.

In the results section (page 14485, lines 1-5), I did not see how figure 1 showed how treating litter yielded a stronger immediate respiration response than treating mineral soil. A little more description of how figure 1 shows this, either in the text or the figure legend, would be useful.

> Authors' response: We have added information in the text to help distinguish these effects in Table 1 and Figure 1.

In the discussion on page 14487 you talk about the possible factors that affect labile C limitations in litter in your girdled plots. It is possible that the lack of a canopy may result in increased photodecomposition of litter, which may differentially affect litter chemistry between girdled and reference plots.

> Authors' response: This is an interesting point. Unfortunately, we have no measures of photodegradation in these plots, but we have added the following text to the Discussion: "Enhancement of substrate availability through chemical changes could have occurred via increased pho-

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todegradation (Gallo et al. 2009), another possible effect of tree mortal-
ity due to opening of the canopy."

Technical Corrections

Table 1: Rmax, k, and alpha are not defined in the table legend. Additionally, the
mention of alpha (as a statistical parameter) in the legend is confusing as the same
symbol is used to represent something completely different in the body of the table.

>Authors' response: We have changed alpha in the model to gamma, which
>avoids this confusion.

Figure 1. The fact that different symbols are used to show different chambers, but
there is no figure legend is confusing. This makes this figure difficult to interpret and of
limited value. Is there a way to show mean values for treatments, soil type, etc.?

>Authors' response: This is a very good point, and we have changed this
>Figure to display means for each treatment with standard error bars
>(Figure 1).

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