

## ***Interactive comment on “Metabolic tradeoffs and heterogeneity in microbial responses to temperature determine the fate of litter carbon in a warmer world” by Grace Pold et al.***

**Grace Pold et al.**

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Thank you for your comments. Here is a line by line response to your concerns:

“Especially when the authors refer to Fig.1, which could be a great roadmap to the different scenarios tested, there are almost always mix ups with which letter represents which scenario”

We identified one mix-up in the figure caption and remedied it. Figure 1 has also been simplified and its modified version is attached here. The full caption is as follows: ‘Schematic of experimental design used in this study, where CUE temperature

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response (Ct) varies as a function of the number of enzymes and/or taxonomic affiliation of organisms. Graphs show the effects of having homogeneous (A) or heterogeneous (B) Ct across taxa; the effect of forcing a positive (C) or negative (D) correlation between the number of enzymes and Ct; bacteria showing a positive Ct and fungi a negative Ct (E); fungi showing a positive Ct and bacteria a negative Ct (F); or fungi and bacteria both having positive (G) or negative (H) Ct. Horizontal dashed lines indicate a Ct of zero, and clusters of points above and below this line denote when CUE tends to increase or decrease with increasing temperature. The letters F and B in the x-axis of individual graphs denote sensitivities for fungi and bacteria, respectively. Figure prepared in BioRender

“The figure itself also looks kind of distorted, at least in the pdf that I got. Lines that should be straight are not and dots are not round.”

We have made a new copy of this figure using a different software.

“In Figure 3 the legend suddenly brings up the categories ‘continuous’ and ‘discrete’, which have not been mentioned before and are not explained in the figure caption.”

The language has been remedied to be consistent throughout the manuscript.

“In figure 4, the order of categories is ‘decrease’, ‘increase’, and ‘none’, while in the corresponding section in the manuscript it is different”

The order has been changed to “increase”, “decrease”, “none” to keep in line with figure 1 and with the text where figure 4 is referenced.

“Also in figure 4 there is a graph with an axis title that says ‘CUE at 15°C’ and one with just ‘CUE’ what is the difference?”

‘CUE at 15°C’ refers to the biomass-weighted CUE of the surviving community without 5°C of warming (i.e.  $Cr + Ce + Cu$ ). ‘CUE’ refers to the CUE at the temperature where the simulations took place (i.e.  $Cr + Ce + Cu + Ct^*(\text{temperature} - 288K)$ ). The appropriate equations have been added into “Analysis of outputs” section, and the two CUE

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outputs have been renamed to be less confusing. Specifically, 'CUE at 15C' has been renamed to 'Reference temperature CUE', and "CUE" has been renamed to 'Simulation temperature CUE'.

"The reference list includes duplicates."

The duplicate Pietikäinen reference has been removed.

"A lot of the data that is mentioned in the text is not shown in any graphs or tables or wrongly referenced to e.g. lines 204-207."

We believe there is only one piece of data is not shown in a table or graph ('Intriguingly, neither litter ( $r=0.16$ ,  $p=0.23$ ) nor microbial biomass pool sizes ( $r=-0.44$ ,  $P < 0.001$ ) positively correlated with extracellular enzyme investment'). It is a post-hoc attempt to explain correlations between litter or microbial biomass carbon pools, which we feel can be adequately described by a simple statistic.

"1. The title as well as the abstract are quite catchy but I think are overselling what the results of the paper show. Especially since the authors themselves state that their findings partially contradict findings from other modelling studies and empirical evidence is lacking."

The title has been modified to 'Metabolic tradeoffs and heterogeneity in microbial responses to temperature determine the fate of litter carbon in simulations of a warmer world' to clarify that these are simulations. The final sentence of the abstract has been modified to reiterate the contingency of the results on model structure as follows: 'Together these results implicate a role for diversity of taxon-level CUE responses in driving the fate of litter C in a warmer world, which should be explored within the framework of additional model structures and empirical studies.'

"The forth hypothesis is not very well introduced before"

Sorry – this was a little hidden in the sentence, 'In other instances, CUE may be modeled as fixed within taxa, such that changes in community-level CUE with warming are

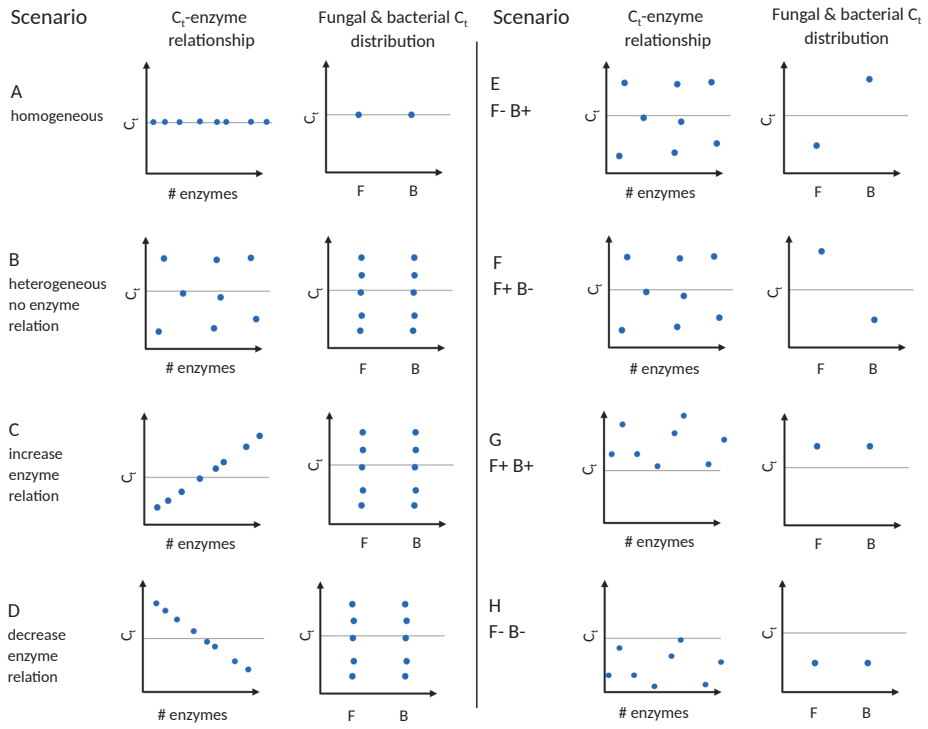
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the result of shifts in the dominant group or groups of organisms present as a function of their dietary preferences and/or C:N ratio (Wieder et al. 2013, Sistla et al. 2014).' We appended an additional sentence to spell out this point more clearly: 'This phenomenon may occur, for instance, if large C-rich fungi show less-positive responses to warming than small, N-rich bacteria do (DeAngelis et al. 2015).'

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**Fig. 1.** Revised figure 1. See comments for full caption.