We appreciate the supportive comments and careful reading of our manuscript from Dr. Smith. We have made all of the minor corrections he recommended, and provide a point-by-point summary of these changes below. For clarity specific reviewer comments are numbered for each reviewer (in italics). Our responses (in bold) follow each comment. More extensive changes are also noted in the revised manuscript are also noted with the same numbering scheme to clearly note how we incorporated reviewers' suggestions.

*R2.1 [P2012 L2: Projecting biogeochemical -> projecting realistic biogeochemical]*

**Done**

*R2.2 [P2012 sentence beginning L8: You mention "oligotrophic and copiotrophic" twice in C358 this sentence and it could be rewritten to make it read better]*

**This sentence has been rewritten: "Drawing from the application of functional traits used to model other ecosystems, we incorporate copiotrophic and oligotrophic microbial functional groups in the MIcrobial-MIneral Carbon Stabilization (MIMICS) model; these functional groups are akin to 'gleaner' vs. 'opportunist' plankton in the ocean, or *r-* vs. *K*-strategists in plant and animal communities"**

*R2.3 [P2012 L12: animals -> animal]*

**Done**

*R2.4 [P2014 sentence beginning L6: should say "scale from".. to something, not just scale from. Hope that makes sense.]*

**It does, thank you the phrase now reads "…scale from organismal traits to ecosystem processes and global fluxes"**

*R2.5 [P2047: You don't say what the bracketted numbers are and you don't define all of the symbols. Either do so in the legend or refer to somewhere that definitions can be obtained.]*

**The revised caption now mentions the following new information, "Decomposition of litter and available SOM pools (SOM$_a$) are governed by temperature sensitive Michaelis-Menten kinetics (V$_{max}$ and K$_m$), red lines... Bracket numbers correspond to the equations for fluxes described in Appendix A1. The definition and values of parameters are included in Table B1"**

*R2.5 [P2017 L18: proscribed->"prescribed" ?]*

**Done**

*R2.6 [P2018 L1: I get lost in the paragraph before this (where you fix microbial biomass constant) and this one, where it somehow varies. I don't understand how the "original parameterization of MIMICS produced biased results,". You need to be clearer in your*

*description of the experimental design - it's a bit grabled in this part of the manuscript - please somehow break it out into something more structured so it's easier to follow. Perhaps just a paragraph at the start of the section giving an overview of the experimental design.]*

**This long paragraph has been broken up, and restructured to clarify our approach.**
*R2.7 [P2019 L17: This does not "resolve uncertainties", this just explores sensitivity to parameter variation. I recommend you change this to "explored the sensitivity of MIMICS model global scale predictions to parameter variation" - also note comment below that you mention NOTHING of the results of this analysis in the rest of the paper]*

**We apologize for the vague language in this sentence, which now reads "In applying MIMICS at global scales and to a depth of one-meter we adjusted parameter values $\tau$, $f_{met}$, and $P_{scalar}$ (Appendix A3)."**

*R2.8 [P2020 L20: I don't follow your logic. You suggest that because the 2 models have similar performance to simple statistical models that somehow their predictions are "adequate"? Adequate for what? Adequate for replacing statistical models? Not really, they perform the same. Please explain better your judgement of the quality and value of these fits because it's not at all clear. I think the fact that you get a good fit is great - the addition of realism has not made the predictions worse - though you MUST explain somewhere (briefly) how you chose your parameters and how much tuning you did. Adding a mechanism with full freedom to tune parameters almost certainly should increase predictive performance. ]*

**Dr. Smith is correct, the notable result here is that MIMICS fits LIDET data as well/poorly as DAYCENT. We have removed the confusing sentence and unnecessary value-laden statements and modified the presentation of results in Section 3.1.1. We also have clarified the relevant parameterization changes from our previous work in the methods (see comment re. P2018 L1, above), which are in Appendix A1 of the revised manuscript, and acknowledge while our findings are promising, they are not a panacea.**

*R2.9 [P2024 L7: then-> than]*

**Done**

*R2.10 [P2024 L6: please comment on the interannual variation apparent in Fig. 5b - why do the dynamics for both models have an irregular oscillation with regular periodicity superimposed?]*

**We suspect the irregular oscillation and regular periodicity observed in Fig. 5b results from the anomaly forcing protocol used to generate the biogeochemically coupled RCP8.5 results in the CLM4.5 simulation that were also used in MIMICS simulations. We note, that further study is needed to investigate how the timing and magnitude of litter inputs and temperature variation effects soil C projections in MIMICS.**

*R2.11 [RESULTS: I didn't see anything to do with the results of your parameter sensitivity analyses. That should be in there if you mention it in the methods!]*

**Comment [WW1]:** Does this response adequately answer the reviewer's concerns?

This has been clarified (see previous statement P2019 L17, above).  We do not introduce a sensitivity analysis in the methods.