Sihi and co-authors present a nice overview and comparison of microbial-explicit soil C models. This is a timely study in light of the many recent papers presenting nonlinear microbial models and the recent efforts to integrate such models into Earth system models. The authors address the underlying assumptions that lead to Michaelis-Menten (MM) versus reverse-MM depolymerization kinetics, and explore how the underlying kinetics affect the projected response of soil C to warming.

The revised paper has been significantly improved in its organization and clarity. Following the recommendations of the previous reviewers, the presentation of each of the three nonlinear models and their comparison to the traditional linear model is much easier to follow. It would be useful to the community if the authors included a brief discussion in their conclusions regarding their recommendations for future nonlinear soil C models based on their findings.

There are a number of instances that the text and methods are unclear, however, and could be better explained. This is especially true for the "tuning" of parameters, including temperature sensitivities. The paper also needs to be thoroughly proof-read for typos and grammatical mistakes.

Specific comments and technical corrections:

P1, L19-20: It would be good to briefly mention here what kind of interactions are needed to avoid oscillations. The current sentence "… limitations other than through enzyme-substrate interactions…" does not read very well and is not very informative.

P2, L8, L14, etc. This is minor, but check punctuation for " e.g., " and " i.e., " throughout the text.

P3, L1-2: Check sentence and verb tenses. "A comparison to traditional first order models further shows that microbial models display…"

P3, L10: What do you mean by quality here? Recalcitrance, nutrient content, type? Remove "and" from before soil quality and put "content" after the word "nutrient" in this sentence.

P5, L5-6: This sentence doesn't read well. Consider "… interaction between enzymes and substrate that results in the depolymerization …"

P5, L14: Check sentence. Consider "… both fresh and microbial … before they can …"

P7, L1-3: Consider revising sentence to "… derived for the case where an enzyme can adsorb to only a fraction …"

P7, L4: "appearing" instead of "appears".
P8, L21-22: Drop the s from "becomes". Please revise comma placements and tenses.
P9, L19: traditional decomposition models (plural)

P10, L2-3: I wonder, how much would your results change with a first order model that contains multiple pools? Traditional models generally have multiple pools with different temperature sensitivities.

P11, L17: "Modifications" should be plural.

P12, L17-19: This sentence is a little awkward. What do you mean by "working their tuning factors directly into these two parameters"? By "tuning factors" do you mean temperature sensitivities?

P12, L4-5: How do you choose this precise value of 0.37 for the parameter Km? From what I can tell, there isn't much support in the text for this value, other than it being smaller than M. How does this compare to Km in other modeling studies and from experiments?

P12, L7: When you say Vmax,REV is tuned, do you mean the underlying Vmax,i and Q10 values? How do you tune Vmax,REV? Similarly for Vmax,OPT on P12, L9-10.

P13, L21: Do any of the "traditional models" have temperature sensitive CUE?

P 14, L3-6: This paragraph is confusing. How exactly do you perform your parameter adjustments? What do you mean by not allowing Q10 to differ? Do you mean that the values are the same across the models or at initial times? Please be clear on your methods here.

P15, L1-2: "dynamics are…" (plural)

P16, L14-17: What conditions or parameters would lead to such an imbalance that would cause M to decay or grow indefinitely?

P18: It seems that you should refer to Fig. 3 in the text here.

P18, L6: In Fig. 3, it looks like the dashed "with MR" lines for FWD (blue) are much more oscillatory (in frequency and magnitude) than the solid line. Maybe I'm missing something, but does including MR really decrease the oscillation frequency as stated in L6?

P18, L24: "resulted in a" instead of "into"
P19, L10: You could cite Hararuk et al. GCB 2015 here.

P19, L16-17: The first part of this sentence doesn't seem to be "evidenced" by the second part of the sentence. Also, just a note that oscillations can be stable (and often are in these models) in that they eventually approach a steady-state.

P19, L18: Interplay of soil organic matter with what? Microbes? Please clarify.

P20, L10-14: You may also want to cite and take a look at the Equilibrium Chemistry Approximation (ECA) kinetics as proposed in Tang & Riley 2013 and Tang 2015, which can be thought of as a hybrid between MM and reverse MM depending on the conditions.

P20, L16: Does your analysis robustly show this or just from the figures? All of your models are in fact stable dynamical systems given the chosen parameters. Even the models that oscillate are dampened and eventually approach a stable steady state.

P21, L7: Tang & Riley 2015 may also fit here given their incorporation of dynamic energy budget theory.

P21, L18: … cost approaching zero…
P21, L21: remove "a" from "via a half saturation constants"
P21, L22-24: Consider revising this sentence.
P21, L3: Sentence fragment.

P24, L6-7: Is this assumption justified?

P24, L18: Check grammar/wording. Remove "to" and comma after complex, and add a period at the end of the sentence.

The conclusions section could benefit from a brief discussion on where such models are going and what recommendations the authors have for the community based on their findings.

Check grammar and content of the Fig. 1 caption, particularly (b) and (c).

Fig. 2 (d) the color of the initial straight line looks purple. It might also be good to add a note in the caption that the value of CUE is the same across the models, since the lines completely overlap.

P47, L1: Fix "growth".

Fig. 3: This graph is a little busy with so many lines. Why do some of the modified models start from different microbial biomass conditions? You may want to use SS Microbe instead of Eq. Microbe in the legend.