

## ***Interactive comment on “Responses of two nonlinear microbial models to warming or increased carbon input” by Y. P. Wang et al.***

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Wang et al. analyze and compare two basic SOM models with explicit representation of microbial biomass. The main difference is the use of two version of substrate kinetics. The consequences of this difference are demonstrated using analytic and simulated perturbation examples. Some of the highlighted differences could be used to design experiment to reject or improve alternative model structures. These results are important and interesting to a wider community. I enjoyed reading the paper.

C6275

### **1 General comments**

The background on the model differences is quite short (p. 14654 L 11ff). The notion of either substrate or enzyme to be rate limiting is to my opinion misleading. Kinetics in both models depends on the same two properties. The difference is where the non-linearity is placed, and the range of applicability based on concentrations of the enzyme and substrate (see Tang 2015 GDD).

The authors take caution with interpretation and often display differences without evaluating them. In the discussion I miss some expert judgement on what is more likely. E.g. An increase in soil carbon stocks with warming given the same inputs is unlikely at the soil column scale (p. 14666 L23).

In Appendix A: In what way correspond the eigenvectors to the three carbon pools. This needs a bit more explanation.

I checked the equations in the main. I like the approach with the non-dimensionalization of Appendix C. However, I was not able to follow step C5 to C6.

### **2 Specific comments**

My other comments are mainly technical corrections.

(p. 14654 L1 8):  $F < 0$ ? Mathematically  $F \neq 0$ , reasonably  $F > 0$

(p. 14654 L 20): two typos  $\alpha$  versus  $a$

(p. 14660 L1): repetition of  $t_{50}$ .

(p. 14662 L1): please clarify that laboratory parameters where used, and that no calibration was performed

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(p. 14666 L5): good summary in Table 2. The discussion following line 10 is difficult to read. Maybe state the main difference and then explain in detail.

(p. 14666 L23): The authors are take caution and often display differences without evaluating them. In the discussion I miss some expert judgement on what is more likely. E.g. I think an increase in soil carbon stocks with warming given the same inputs is unlikely at the soil column scale.

(p. 14671 L1): The relationship of the eigenvalues and the three pools need to be explained in more detail.

(p. 14672 L19): What is the “third element of eigenvectors”

(p. 14675 L18): Need more space after comma between variables. In this form it is hard to distinguish. Several commas are missing.

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