

Interactive comment on “Oscillatory behavior of two nonlinear microbial models of soil carbon decomposition” by Y. P. Wang et al.

Anonymous Referee #1

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I sincerely appreciate the paper by Wang et al. It is timely and thought provoking. And, more importantly, I learned a lot. The paper was every well written: the mathematical analysis is elegant and thorough, and the conclusions are consistent and sound. So I do not have much to say about the paper itself, though I found the legend in Fig 4 is not always consistent with its caption.

Besides, I think people (including myself) working on soil carbon dynamics would like to hear more of the authors' thoughts on how to improve the nonlinear model or the linear model vice versa. In this discussion paper, the authors quoted three empirical metrics to challenge the non-linear model: (1) the damped oscillatory behavior which is hardly seen in measurements; (2) the soil carbon pool is insensitive to the input and (3) the priming effect. It would be very helpful if the authors could add a paragraph or

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a table to recommend a more complete list of empirical metrics that could justify reasonable nonlinear model structures (I think the paper has a list of good people to come up with such a list). For instance, when fitting a linear model to the measurements, effects such as that from soil minerals (as often indicated by clay content) and litter quality are implicitly integrated. Those effects are not present in the nonlinear model as quoted here. Therefore, these non-linear models are (to some extent) too simple to meet the metrics (1) and (2). In general, it will not be difficult to create more complicate non-linear models to resolve the metrics (1) and (2) within the uncertainty, yet more unexpected dynamics will also be introduced. If the authors could provide some guidelines on when and where to stop adding more complexities, it will greatly benefit the development of new and better soil carbon models.

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