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# ***Interactive comment on “Quality or decomposer efficiency – which is most important in the temperature response of litter decomposition? A modelling study using the GLUE methodology” by J. Å. M. Wetterstedt and G. I. Ågren***

**Anonymous Referee #3**

Received and published: 6 January 2011

Wetterstedt and Ågren present the results of a decomposition modeling exercise that compares the ability of models that use one or two initial litter qualities and/or fixed or temperature dependent decomposer efficiency to simulate short-term respiration of litter carbon at variable temperatures. Importantly, they find that allowing decomposer efficiency to vary with temperature best predicted respiration with changes in temperature; model predictions were insensitive to the number of initial quality “pools” with different temperature sensitivities (one versus two). Using a flexible efficiency allowed the model to better fit the data by replicating temperature history effects. Their re-

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sults add to an important (but still relatively small) group of studies that examine the mechanism(s) behind the response of decomposition to temperature change.

From the abstract, it is a bit unclear what the main findings of the manuscript are (see more detailed comments below). Clearly answering the question posed in the title would aid the clarity of the abstract (e.g., that the best model used a flexible efficiency and that model predictions were insensitive to litter quality). In the last sentence of the abstract, it is not clear what the “other factors” the authors are referring to are – microbial efficiency? Temperature history?

The authors use the Generalised Likelihood Uncertainty Estimation (GLUE) framework to compare models, an approach that is not frequently used in the decomposition literature. As such, a short discussion of this framework early on in the manuscript – its philosophy, why it was chosen, and its advantages in comparison to other more common methods (e.g., Bayesian, AIC) – would be helpful. Something like an expanded version of the first paragraph of the Conclusions, but early in the paper when the method is introduced.

It is also unclear how initial quality was determined for the two initial qualities model, and why values for these parameters were fixed rather than estimated as for the one initial quality model.

Finally, the authors spend some time discussing (in the discussion and abstract) predicted differences in carbon quality using the flexible versus fixed efficiency models. This question seems a bit out of the blue: it's not clear to the reader that there was a hypothesis or question regarding this point; the results show up for the first time in the discussion; and it is not clear if this pattern is reflective of real data or just an interesting simulation result (on a related note, is Fig. 6 all simulated data?). A relatively large amount of text is devoted to this point in the abstract, despite the fact that it did not seem to be a main point of the research (although it is interesting).

Abstract:

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L8-9: All four models were calibrated using this data set right? Not just one model?

L9-10: Did all four models give good results, except just after the change in temperature? Or are the authors referring to the “best” model only?

L18: Variation in the temperature sensitivity of what? Being explicit about what the “other factors” are would help clarify this sentence.

Introduction:

P8701-2 L26-1: A very long and unclear sentence. Perhaps break into two sentences, ending the first after “an incubation experiment.” And beginning the next, “We used/compared various formulations of the Q model to analyse the importance of these factors...for predicting/describing decomposition.” If this is what the authors mean.

P8702 L4-6: The consequences for what?

Results:

P8708 L6: where should be were

P8708 L7-9: Behavioural models were defined as in section 3.1?

P8708 L21: Should with be by?

P8710 L4: The effect of efficiency and quality on what?

Discussion:

P8712 L23-24: I think this should read “If decomposer efficiency goes down with increasing temperature...”.

Figure 5: keep the terminology fixed and flexible for eo rather than one and several.

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Interactive comment on Biogeosciences Discuss., 7, 8699, 2010.

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