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Interactive comment on "The implications of microbial and substrate limitation for the fates of carbon in different organic soil horizon types: a mechanistically based model analysis" *by* Y. He et al.

Anonymous Referee #2

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General comments The paper evaluates a microbial explicit modelling framework for boreal forest soils, and assesses the sensitivity of key parameters. As identified by the authors, the results have broader applicability than the example used in the paper. However, I agree with the comments of W Wieder, that the paper needs to be restructured to highlight this message, and the reason why microbial models are required. At some level, all mechanistic models are empirical in nature. The strength of the paper is the sensitivity analysis of the key parameters. The authors imply that there model is an improvement of Yi et al (2009), however no evidence is presented to justify that. The

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authors are critical of site-specific model parameterizations. However, the authors have chosen to test the sensitivity of the model against site-specific data, and therefore this parameterization of the model may not have specific biological meaning. It is not clear from the paper whether the model described would predict significantly better than the empirical models under climate change. In the discussion the authors acknowledge that the model only weakly captures the effect of moisture, and that soil moisture could be a key determinant of how the soil will respond under climate change. This argument needs to be considered when formulating the introduction / discussion as they indicate that this type of model will be better able to predict the effects of climate change. It could be argued that this forms the basis, but still needs further development to fully capture the moisture effects. Specific comments There is no justification given for the MIC:SOC ration being fixed at 2% or the CUE being set at 0.4. The assumptions behind these parameter values need to be made more explicit. It is not clear from SI Fig 1 that a sample size of 2000 produced narrower standard deviations than a sample size of 1000. The authors only give information on how the original model performs in relation to soil respiration. There is no evaluation of model performance against the measured soil c stocks.

Technical issues Fan et al (2008) and Mack et al (2009) are missing from the reference list. Mathworks, 2012a is missing from the reference list.

Table 3 – there are 10 parameters included in this list.

P2240- line 10, I think the word should be which only instead of while only.

P2247 – delete As from line 5.

Supplement The units of the variables should be defined. In equation 14 – MICtoSOC is no defined. In equation 17 it looks like the font has been corrupted (italics / non-italics) in dSolubleC

Interactive comment on Biogeosciences Discuss., 11, 2227, 2014.