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Interactive comment on "Disentangling residence time and temperature sensitivity of microbial decomposition in a global soil carbon model" *by* J.-F. Exbrayat et al.

J. Xia (Referee)

jxia@ou.edu

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Comments on Exbrayat et al. Disentangling residence time and temperature sensitivity of microbial decomposition in a global soil carbon model. This paper includes some very interesting analyses which try to improve our understanding of the huge uncertainty in global soil carbon modeling in current generation of earth system models. The authors used a simplified model to explain the uncertainty in modeled soil carbon stock among 17 global land models, and largely reduced the uncertainty through constraining the simplified model parameters by a global soil carbon database. The paper is well written and the quality is high. The topic is also in the scope of Biogeosciences.

The only issue I found in the paper is that the authors used a range of Q10 from 1.5 to 2.5 together with a combination of baseline turnover rate k from 10 to 40 years (Line 142-144). I plotted the fT in equation (2) and (3) against air temperature with the lower (1.5) and upper (2.5) limits of Q10 (please the following figure):

<insert Fig. 1>

The above figure is simplified version of Fig. 5. Then I found many results in this study in a relatively simple way. For example, the Q10 difference is much smaller with air temperature <15oC (which was set as the baseline temperature in this study) than that with >15oC. In the historical simulations, the temperature is relatively low, and then the sensitivity of fT to Q10 might be relatively small in comparison with the 4-fold variation in k. That means, although the authors used different values of Q10 in the analyses, but fT didn't vary much in the historical simulations. This may result in the more important role of k than Q10 in Fig. 1. Similarly, since temperature increased by several degrees in future projections (RCP8.5), Q10 became important in Fig. 2b (Lines 213-217). As shown in the above figure, when air temperature is <15oC, a lower Q10 leads to a higher fT. That's why the authors found 'models with the largest value of Q10 tend to accumulate only 69Overall, I would like to recommend the journal to accept this paper after a minor revision.

Please also note the supplement to this comment:
http://www.biogeosciences-discuss.net/11/C774/2014/bgd-11-C774-2014-supplement.pdf

Interactive comment on Biogeosciences Discuss., 11, 4995, 2014.

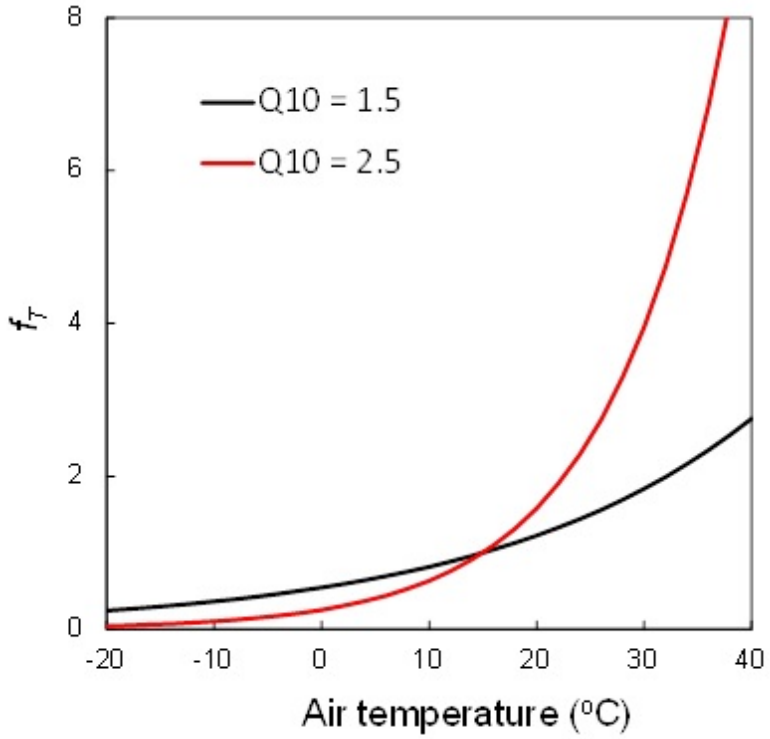

Fig. 1.