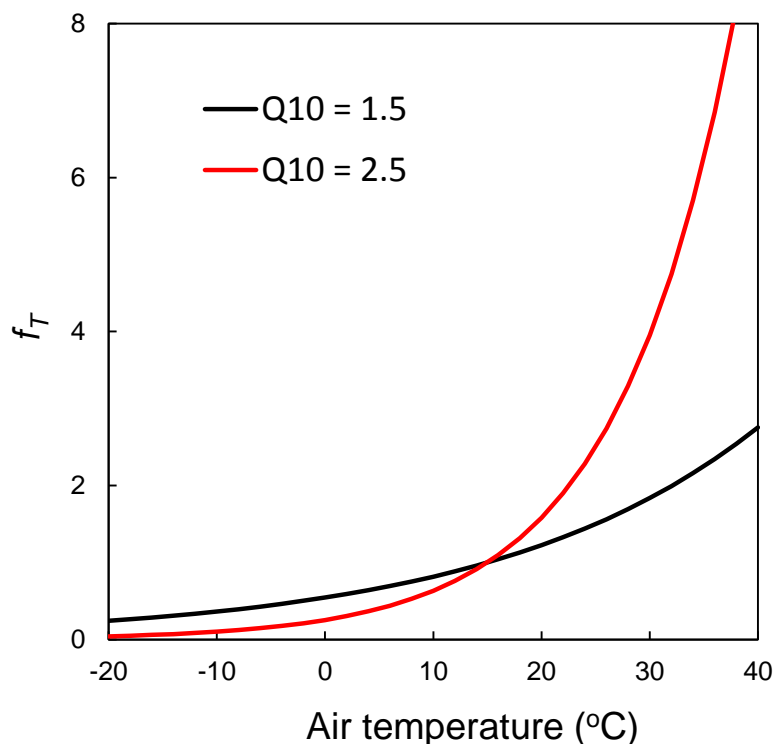


Comments on Exbrayat et al. Disentangling residence time and temperature sensitivity of microbial decomposition in a global soil carbon model.

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 Q_{10} 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 f_T in equation (2) and (3) against air temperature with the lower (1.5) and upper (2.5) limits of Q_{10} (please the following figure):



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 Q_{10} difference is much smaller with air temperature $<15^{\circ}\text{C}$ (which was set as the baseline temperature in this study) than that with $>15^{\circ}\text{C}$. In the historical simulations, the temperature is relatively low, and then the sensitivity of f_T to Q_{10}

might be relatively small in comparison with the 4-fold variation in k . That means, although the authors used different values of Q_{10} in the analyses, but f_T didn't vary much in the historical simulations. This may result in the more important role of k than Q_{10} in Fig. 1. Similarly, since temperature increased by several degrees in future projections (RCP8.5), Q_{10} became important in Fig. 2b (Lines 213-217). As shown in the above figure, when air temperature is $<15^{\circ}\text{C}$, a lower Q_{10} leads to a higher f_T . That's why the authors found 'models with the largest value of Q_{10} tend to accumulate only 69% of the amount that the lowest Q_{10} models do' at lines 209-211. Also, the results in Fig. 7b are reasonable because hot regions near the equator will act as C sources since high temperature rapidly increase f_T , while low temperatures in cold regions limit the f_T . The issue I raised above is for the current models which usually use the first-order parameterization of microbial decomposition. It's better if the authors can discuss it in their revised version.

Overall, I would like to recommend the journal to accept this paper after a minor revision.