

Dear Dr. Exbrayat,

Many thanks for the revised manuscript.

You manage to address most of the comments made by the referees. However, I think a stronger statement of your actual objective in this research is needed, as requested by two of the referees. You should make it clear in the introduction why you have undertaken this exercise, i.e. state explicitly what the purpose of your paper is, and what is hoped to be learned. The final paragraph of the introduction gives an outline of what you do, but not a strong enough sense of your motivation and aims.

Please revise the manuscript on this particular point that I think will help readers understand better what it is you are trying to achieve.

Many thanks,

Jens-Arne Subke

Dear Dr. Subke,

Thank you for this helpful comment. We have followed your advice and have introduced our objectives in the last paragraph of the introduction ll. 80-95:

Here, we use a reduced complexity model representative of current state-of-the-art models of soil organic C decomposition. A systematic sensitivity analysis is performed to disentangle the effect of the time-invariant baseline residence time and the formulation of the dynamic response of microbial decomposition to climatic change on soil C dynamics at regional and global scale. Using these experiments, we seek to investigate the relative contribution of these two inter-related components that drive the absolute and relative change in soil C through time. This is a step towards understanding the origin of the disagreement between CMIP5 models' simulation of soil C and can help in reducing the uncertainty in future model intercomparisons. We also use available estimates of total soil C to assess the added value of observational data to inform the modelling procedure. We attempt to constrain the system's response to climate change by identifying model versions that simulate amounts of soil C mobilized in the active cycle that are outside the confidence intervals estimated for the observations. We argue that, due to the first-order parameterization, such model versions are unlikely to provide reliable projections of the response of soil C pools as they would do it for the wrong reasons. We believe that our results will be helpful for the community in the frame of designing future intercomparisons studies such as CMIP6.