This manuscript presents evolution of terrestrial carbon including SOC, microbial biomass carbon etc. from 1901 to 2016 using CLM-Microbe model. The CLM-Microbe model was first validated against various data set. The changes of carbon fluxes and pools in different regions and at global scale were then investigated. The results providing insights about the dynamics of terrestrial carbon pools. However, the write of the paper need improve (e.g reduce repeat of sentences with similar meanings). The paper may discuss more about the implication or meanings of results as a scientific research paper. Besides, the author mentioned in the last paragraph of the introduction that they investigated the effects of environment change on temporal trend of variables related to soil, vegetation, microbes etc., but the author actually did is check the correlations between variables, there are quantitatively effects that are assessed and not summarized in the abstract. I do not mean that evaluation of effects of environment change is necessary, as other part of work has already been enough for a paper published here and consistent with the title, but the author needs reorganize the languages in related sections of the paper. I suggest a minor revision before it can be published in this journal.

Specific comments

Abstract: The abstract presented the major results of research, but what are their implication and significance? Especially, the authors said they evaluated the effects of environment change on temporal trend of variables such as NPP, GPP etc., however, these are not presented in the abstract.

Line 15: 2901-2016?

Line 20-22: This is not a complete sentence, please rephrase it.

Line 39-47: Huang et al also developed an microbial model named ORCHIMIC, and tried to reproduce the global microbial biomass and soil organic carbon etc.. You may need to add 1 sentence to summarized advantages and disadvantages of this model.

Huang, Y., Guenet, B., Wang, Y.L., Ciais, P., 2021. Global Simulation and Evaluation of Soil Organic Matter and Microbial Carbon and Nitrogen Stocks Using the Microbial Decomposition Model ORCHIMIC v2.0. Global Biogeochemical Cycles 35, e2020GB006836. https://doi.org/10.1029/2020GB006836

Huang, Ye, Guenet, B., Ciais, P., Janssens, I.A., Soong, J.L., Wang, Y., Goll, D., Blagodatskaya, E., Huang, Yuanyuan, 2018. ORCHIMIC (v1.0), a microbe-mediated model for soil organic matter decomposition. Geoscientific Model Development 11, 2111–2138. https://doi.org/10.5194/gmd-11-2111-2018

Line 51: delete on of “He et al., 2021”

Line 49-57: This paragraph has some logical problems. Please rephrase it. For example, the third sentence has already included in the first sentence.

Line 78: “the same with” should be “same as”

Line 92-101: Please unified the format of all equations, not just here. Maybe make all “equation (?)” be left-aligned.

Line 133: what’s your mean by “by column”? or it should be “by layer”

Line: 179: Is 1200 years enough for spin-up? You may provide a plot for this showing the change of soil carbon.

Line 275-285: which year of model results were used in validation and comparison? If results after the spin up were used, then the change of NPP and SR should be similar if your model had really reached its steady state.

Line 458-459: This sentence partially duplicates the previous one. Besides, many sentences are presenting similar results in this paragraph.

In section 4.1: Incorporation of microbes into the model may help improve modelling SOC and other variables, but I think it is hard to improve SR as SR is more or like controlled by input (NPP). Of course, if the model runs long enough, it may change SR through change the soil properties (moisture, temperature) by changing soil SOC content (this will change conductivity and porosity etc.)

Line 542 558: Could the overestimation of microbial biomass in top 1m soil be attributed to O2?