

Authors response to review submitted on 06 Dec 2021 for soil-2021-81

Dear authors,

Thanks a lot for considering the feedback I gave on the initial version of your manuscript. You have incorporated most of my comments adequately, but I would like you to clarify a couple of things in the manuscript:

The authors are thankful for your additional advice to improve the quality of our manuscript. We clarified the suggested points.

- With respect to the title: how about '[...] mineral phase characteristics', instead of 'mineral phase parameters'?

It is a good option, we decided to change it according to your suggestion.

- The Discussion section is still one uninterrupted text. The readability would be increased considerably by splitting this into subsections.

Agreed, subsections were added to the discussion

- With respect to my comment to line 41, about POC: would be good to include this argumentation in the manuscript, so it's clear to the reader why POC was not studied

Thank you for this valuable hint, we added the explanation to these lines.

- With respect to my comment to line 108-109, about the abbreviations: I leave this up to you, but I think the readability of the text will be increased substantially by using more intuitive names for your study sites

We decided to keep the abbreviations even if they are perhaps not fully intuitive. The full terms would increase the length of sentences too much. Shorter abbreviations are difficult because letters always appear in several terms.

- With respect to my comment to line 134, about CFE: As CFE is generally performed on fresh soil, to make sure the microbial community is as little disturbed as possible at the time of analysis, I would like to ask the authors to justify performing the analysis on frozen soil (either through citing articles showing that this has little effect on the measured MBC, or by providing the data that's not shown). In addition, I would like to ask the authors to mention in the manuscript that CFE was performed on samples that were frozen prior to analyses, this is important methodological information that is currently not mentioned.

According to Stenberg et al. (1998) freezing of soil samples at -20°C does not affect the microflora, so it is a widely accepted method for sample preservation in soil microbiology.

Stenberg, B., Johansson, M., Pell, M., Sjö Dahl-Svensson, K., Stenström, J., Torstensson, L., 1998. Microbial biomass and activities in soil as affected by frozen and cold storage. Soil Biology and Biochemistry 30, 393-402.

- With respect to my comment to line 205-206: Table 1 describes much more than 10 parameters, so this is not clear.

We added the information that only 10 from 23 parameters were selected, further we added information to Table 1 indicating which parameters were chosen.

- With respect to the previous formulation of models of 'sufficient extent': Would be good to clarify in the Material and Methods section what you consider a sufficiently good model

Classification of explained variance regarding their quality is for examples given by Cohen (1988) or Achen (1990). Cohen for example termed explained variance (R^2) above 0.26 as 'high'. (For our study, however, an explained variance not much larger than 0.26 is not really high. To stay away from such discussion we focused on a relative assessment of models. If a model had a higher explained variance and a lower RMSE, it was termed as 'superior' to models with lower explained variance. Following the reviewer's advice, we removed insufficient terms of model quality and added additional information to material and methods: 'Both R^2 and RMSE were used for a comparative assessment of different models rather than for an absolute valuation.'

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences (2nd ed.)*. Hillsdale, N.J.: L. Erlbaum Associates.

Achen, C. H. (1990). What Does "Explained Variance" Explain?: Reply. *Political Analysis*, 2(1), 173–184. [doi:10.1093/pan/2.1.173](https://doi.org/10.1093/pan/2.1.173)

- With respect to my comment to line 243: This has not been changed at this location in the manuscript, please do so

We rephrased the sentence using a more neutral term.

- With respect to my comment to line 309-310: As you discuss the results of your model in the previous sentences, starting this sentence with 'accordingly' refers to those sentences. Would be good to rephrase this, and make it clear that this statement refers to the article you cite at the end, e.g.: 'For example, Kaiser and Guggenberger showed that ...'

We adapted this sentence to avoid any confusion.

- With respect to my comment to line 342: Please clarify this in the manuscript as well

We added some information to explain what 'multidimensional' means

- With respect to my comment to line 381-382: I would like to ask the authors to change this wording. You cannot assume that a property you didn't investigate contributes to concentration of SOC fraction, and 'explains' the gap in explained variance. However, you can hypothesize this.

Agreed, we changed it accordingly.