

## Response to the interactive comment by the anonymous referee # 2

The article entitled “Whole soil warming decreases abundance and modifies community structure of microorganisms in subsoil but not in surface soil”, address the impact of soil warming in the soil microbial community. The article fits the scope of the journal and it will be of great interest for the journal readers.

The introduction summarized the previous knowledge in the topic in clear and concise way with clear and funded hypothesis.

We thank the reviewer for the constructive and insightful comments. Below we provide our point-by-point reply and we believe the comments will help us further improve the manuscript.

The material and methods described in detail the laboratory analysis, but the description of the experimental setup is very brief. How was the temperature increase in the soil profile done? The articles you cited would probably describe it in detail and if a reader is interested can go and check those articles; but a short description here (no need to go in deep detail) would help to understand the setup of your experiment.

We agree that we probably oversimplified the description of the methods section and will add some more detail. As mentioned by the reviewer, a basic understanding of the experimental setup should be possible without necessarily checking additional articles.

We suggest adding the following sentence in line 103: All plots were equipped with vertical steel pipes, which contained resistance heater cables and sand in warmed plots and sand only in control plots. Additionally, two rings of heating cables were buried at 5cm.

In the result section, the soils depths shown in your tables and figures is not clear. At some point, looks like you sample the 0-5 cm soil surface, and then you sampled in intervals of 10 cm until 85 cm depth, but that is not what I stated in the material and methods. Maybe including the sampling intervals instead of the middle point of it will be clearer. Secondly, when you describe the results in the section 3.1, 3.2, 3.3 and 3.4 the numbers do not match with the respective tables. Are those numbers an average on control and warm soils? If so, this need to be clarify in the text. Regarding the MBC, this data have been used for another paper that has been resubmitted, in my opinion you could discuss about it but not include as a result.

Generally, we did all analyses in 10cm intervals, so from 0-10cm, 10-20cm,... 80-90cm. It is true we only mention this in the last sentence of the method section and should highlight it better in the figures and tables. We will make these changes accordingly by using sampling intervals as suggested.

We also agree with the second point, as to the mismatch in numbers between text and tables. In the tables we show averages for control and warmed plots, whereas in the text it is the overall averages of control and warmed soils. We will add a clarifying sentence in the text.

The MBC data are only shown in a supplementary figure in the manuscript by Soong et al. (2021) and not evaluated as the difference between control and warmed plots as shown in this manuscript. We think it is a valuable addition to our manuscript to show these data alongside the other microbial proxies and would like to retain the figure as shown.

Finally, in the discussion section, you mentioned the difference in the heating temperature between the topsoil and the sub-soil in the section 4.2. This should discussed a bit further, since the differences you observed could be easily related to this temperature difference.

We agree that this issue was not addressed enough and we will add more discussion and raise this concern in the paragraph currently starting with line 318.

We propose to adjust line 319: We did observe a similar respiration response at all depths (Hicks-Pries et al. 2017), indicating that the microbial response might be similar despite the difference in temperature magnitude. Nevertheless, temperature controls the reaction rates of microbial enzymes, which in turn can affect microbial abundance (Allison et al., 2010). Furthermore, incubation experiments show strong effects of

temperature magnitude on soil respiration, including subsoil (Yann et al. 2017, Scientific Reports). Thus, the higher magnitude of warming below 20 cm in our experiment might be partially responsible for the observed difference in the microbial response between top- and subsoil.

Below some specific comments

Line 21: Gram should start with capital letter

This will be adjusted accordingly throughout the manuscript.

Line 31: "representative concentration pathway 8.5" this is part of a global model simulation, right? It needs some clarification on the text.

We agree that the formulation is not concise and will adapt this sentence.

We propose to rephrase line 31 as follows: Global model simulations predict a likely increase of air temperatures of 2.6-4.8°C...

Line 39: The reference "Fierer et al., 2003b", it should be a Fierer et al., 2003a before in the text. You need to reorganize the references of this author.

This will be adjusted accordingly.

Line 73-77: You introduce the use of the PLFAs with several examples. You should do the same with the brGDGTs.

We will add some examples in line 75 to have a better justification for the use of brGDGTs. We will further include our hypothesis for the use of brGDGTs as suggested by the other reviewer.

Line 83-93: The hypothesis are clear, but I would suggest rewriting a bit this paragraph. Stating at the beginning that you have two main hypothesis and described them, and then add all the text to back them up.

We will consider this comment in the revisions of the manuscript.

Line 103: Why was the soil heated at different temperatures along the soil profile? A short explanation should be added.

The difference in warming magnitude is due to surface heat loss which predominantly affected the top 20cm. We will add this explanation in the text.

Line 118: Why do you skip some soil depths? I.e. 20-30; 40-50; 60-70; 70-80? A short explanation of why these depths were excluded from the analysis should be added.

The sample amount was limited, that is why we had to select certain depths only.

Line 145: This reference is not in the reference list.

This reference can be found on line 597.

Line 190: Reference of unpublished articles should not be included.

This article has now been accepted and published. We will add the full details, including DOI in the list of references.

Line 365-367: This paragraph is hanging loose, try to connect to with the previous one.

We agree this paragraph needs to be connected with the previous one.

Line 582-584: Please add the DOI number.

This will be added.

Line 602-603: Please add the DOI number.

This DOI number was already there, but not well visible because it was moved to the next page.