Dear Editor,

please find the attached revised version of our manuscript “High-resolution Carbon cycling data from 2019 to 2021 measured at six Austrian Long-Term Ecosystem Research sites”.

We would like to express our sincere thanks for the work the reviewer has done. While we believe that the criticism is not justified everywhere, we also think that this may have been partly due to some misunderstandings. Please see below our point-by-point responses to the reviewer comments and the additional changes we have made. We hope that the revised version entails the necessary adaptations to our last submission so that it is now suitable for publication.

Sincerely

Thomas Dirnböck (on behalf of all authors)

Vienna, 2024-12-02

Response to Reviewer

Overview and general recommendation:

Generally, the authors have made some revisions and improvements to the manuscript according to the reviewers' comments. However, I feel the authors did not try their best to improve the manuscript. There are still the following points that the authors need to pay attention:

1) In the "response to reviewers", authors often did not mention the lines where they have made the revisions, which made the review process inconvenient. In some cases, the authors also mentioned wrongly for the line numbers (e.g. Line numbers for the response to the major comment 2 from reviewer 1) I feel the authors could take the revision more seriously.

Response: We are sorry that the reviewer had the impression that we did not take the revision seriously, as taken from a lack of line numbers in our previous responses. We should point out that it was not possible to provide the line numbers of the revised manuscript, given that ESSD requires uploading all responses before providing the authorization to submit a revised version of the manuscript. Thus, the revised version of the manuscript did not yet exist when the responses were elaborated and, therefore, respective line numbers of the new version could not be added. To overcome this issue, the latest point by point response to both reviews included a throughout description of the intended changes, and, when submitting the new version of the manuscript, we uploaded a track-changed version of the manuscript wherein all the detailed changes were marked up.

2) Sometimes the authors did not respond directly or ignore the comments from authors (e.g. to indicate the elevation in the map) It is definitely fair and reasonable to not accept all the comments from the reviewers. But it is good to give a reasonable reasoning, and in most of cases, I think it only needs at most 1 2 phrases or sentences to explain the situation (e.g. comment 8 for reviewer 1). Besides, sometimes the authors mention they would not change the phrasing but to add some references to support their statement, but they did not specify what they have added (e.g. comment 20 from reviewer 1).

Response: We would like to once again express our gratitude to both reviewers, who provided very useful suggestions to improve our work. In almost all cases, we adapted and added information in accordance with these suggestions and described in detail what we did and why. In the few cases where we did not, we provided a justification. Only in the case of the suggestion to add elevation to the map, we did not.

Reviewer 1 suggested to add elevation in the map (figure 1). We apologize for not responding to this suggestion. The reason why we decided not to add this information to the map was that we wanted to keep the map simple and graphically appealing. Additional information on the sites, including altitude and climate, were included in Table 1. To address the reviewers comment and make this more obvious, we have now added the following sentence to the caption of Fig. 1: "For site information concerning ecosystem type, altitude and climate see Table 1", and have also modified the caption of Table 1 to make clear that it also contains this information. In addition, we slightly adapted the presentation of Table 1.

*Comment 8 of Reviewer 1: In the new version, we specified the sentence to "*This experiment focuses on investigating the effect of changing precipitation patterns on soil nitrogen fluxes, soil

microbial changes, greenhouse gas efflux, and soil water processes." *(L95-97, track-change version)*

Comment 20 of Reviewer 1: In the new version, we added a reference from a study about the causes of spatial soil respiration variation at the site ZOE, which supports the statement (L355, track-change version).

3) Sometimes, the authors could think more to make the information more efficient for instance, for Table 1, both reviewers 1 and 2 suggested adding some more details in the Table to make the audience understand easily. Of course, as the authors indicated, we can find all the information on the website link but I think you would like to make your data be used by peers as often as possible, not just publish a paper, right? Anyway, the weblink is long, but I think you can use for instance some hyperlinks to avoid the long characters.

Response: In our previous response to the reviewers we point out that "Both referees suggested more detailed information in this table: Metadata Table 1: since very detailed description of all sites is available via the cited link to DEIMS-SDR system, we do not want to overload the table and just added the most important information..." The additional information we included is ecosystem type, altitude of the sites, annual mean temperature, and mean annual precipitation.

We thank the reviewer for suggesting the use of hyperlinks to avoid the rather lengthy links to the DEIMS-SDR ID. We will discuss with the Journal editorial office whether this is possible

4) The mean SPEI between 1980 2010 should not be useful enough as a reference to compare with the SPEI data between 2019 2021. As the SPEI is a normalized index considering the distribution of water deficit in the study period (1980 2010), that's why the authors can notice the mean of SPEI between 1980 2010 is close to 0. Hence, in this situation, the mean SPEI between 1980 2010 is not informative and wrongly used. Somehow, it could be rather simple to use P PET as an indicator to illustrate the water status in 2019 2020 compared to the historical period in each site.

Response: We did not calculate SPEI for different periods but used existing gridded data, which was calculated for the period between 1960 and 2021 (and normalized over this period) and extracted the SPEI values for the sites for each year. Then, we compared the mean SPEI values for the measurement years (2019 to 2021) with the 30-year period before these years (1980 to 2010). The SPEI between 1980 to 2010 is close to zero because it is close to the average drought water balance between 1960 and 2021 (only slightly drier). Hence, according to our understanding, the usage of SPEI was correct, and conclusively indicates the drought situation at each site in each of the measurement years compared to the long-term average. In order to avoid any misunderstanding, we added: "Note, that gridded SPEI data set is based on meteorological data for the period 1960 to 2021" to the respective section in L313-L314 (track change version).

5) The figures that reviewers provided sometimes look vague I suggest the authors enlarge the font size to make the figures more readable (if possible, to beautify some plots). Besides, all the figures should be clearly described in the figure caption.

Response: we agree that the font sizes of Figure 4, 5, and 6 are too small. We changed them and accommodated the axes information. And, we adapted the captions accordingly.

Additional changes

Since one of the authors changed his family after submitting, we changed the name and reordered the authors alphabetically (besides first and last author).