

Editorial board,

Biogeosciences

We thank the reviewer 3 for these comments. We respond to all comments below in plain text, while *comments by the reviewer are reported in italic.*

Respiration is a central soil microbial activity and, thus, still an interesting and relevant research objective. This is particularly true for the comparison of field and laboratory measurements of soil respiration. The manuscript presented by Li et al. contains useful information, which can be published after minor revision.

We thank you for this positive feedback!

L26: ... because microbial metabolic activity decreases and ...

We will edit as suggested in line 26 if we get a chance to revise this manuscript.

L34-35: Are 7 references necessary? Another possibility would be to separate the references on the different processes listed before.

These 7 citations cover different aspects of the rewetting pulse, so we would keep most of them. We can remove the citation to Manzoni et al. (2020), where previously published data were analyzed. We can also cite these articles separately for the different experimental designs and data patterns, and revise as follows:

“For example, rewetting induces higher rates of respiration following exposure to more intense (lower soil moisture) (Fischer 2009; Lado-Monserrat et al., 2014; Li et al., 2023a), more extended (longer) (Miller et al., 2005; Tiemann and Billings, 2011; Meisner et al., 2017), and more pronounced (larger differences in water content between dry and moist samples) drought treatments (Fischer, 2009; Lado-Monserrat et al., 2014, Miller et al., 2005; Tiemann and Billings, 2011).”*L46: ... preparations, thus, the ...*

L47: ..., resulting in ...

L51: ... in sieved ...

L40-41, L58: ...; Rousk and Brangari, 2022).

L107, L131: Second-order subsections should be avoided.

L189: Two decimal numbers are not justified.

L192, L297: “similar” not “comparable”

We agree with all above seven language suggestions and will follow them if we have a chance to revise this manuscript.

L193-196: This statement belongs to the Materials and Methods section.

We agree. We will move this statement when we first introduce field soil moisture data in line 99.

Figures 2 and 3: Is it possible to add error indices?

Figure 2 shows the distributions of field data and laboratory data, so it already visualizes the data spread (this figure does not represent mean values or predictions that might require error estimates). For Figure 3, it is practically possible to add error indices. For example, using the bootstrapping method to run random forest for 1000 times, we will be able to get the mean and standard deviation of the importance values (i.e., %IncMSE) of each driver.

L252: I have doubts that downward leaching of DOC is a relevant process. I miss a statement on differences in gas flux conditions. Rewetting water may block pores. Also, the exact soil volume participating in the CO₂ efflux is usually unknown.

We meant that in some field sites, DOC could be leached out, whereas in the laboratory, this does not necessarily happen because the samples are contained in a closed jar. The difference in gas flux conditions will be discussed a bit further down in relation to the effects of soil moisture increments on respiration pulse (line 310). We can revise "Because soil moisture typically declines in the field immediately after it peaks, the period of limited oxygen availability associated with high soil moisture may be shorter in the field than in the laboratory, so that the soil moisture increment may not be as important a driver of carbon emissions in the field as it is in the laboratory."

We agree that having accurate soil volume information would help us to harmonize the units of the field respiration rate and laboratory respiration rate data. However, we do not have site-specific estimates for the soil depth contributing to respiration in field conditions. Assuming that the same depth contributes in all field sites and considering variations in bulk density, we can still convert the units, as shown in Figure R2 in the response letter for reviewer 2. The results were slightly different and we need more detailed contribution soil depth and bulk density information to make this conversion more reasonable. A sensitivity analysis will be attempted to assess the robustness of our results (please see the response to reviewer 2).

L291: No! It is difficult or even impossible to compact dry soil.

We can revise these sentences to read "In the field, shrinking dry soils can make substrates less accessible for microbial decomposition".

L302: ... inaccessible, thus, a ...

We agree with this language suggestion and will follow it if we have a chance to revise this manuscript.

L310-312: Awkward statement! Rephrase!

We will rephrase it into "Because soil moisture typically declines in the field immediately after it peaks, the period of limited oxygen availability coupled with high soil moisture may be shorter in the field than in the laboratory, so that the soil moisture increment in the field may not be as important a driver of carbon emissions in the field as it is in the laboratory".

L324: ... 2015). This might ...

We can revise as suggested.

L569-720; The list of references contains numerous formatting mistakes and gives a sloppy impression.

These references will be thoroughly checked if we have a chance to revise this manuscript.

L596: Volume number is missing!

Volume number “162” can be added, together with any other missing information in the reference list.