

**Reviewer comment:** I still believe that the manuscript's novelty and the targeted knowledge gaps could be better addressed in the introduction. At the moment, the introduction feels a bit general, and could benefit from highlighting the specific novel aspects that will be gained, or gaps in understanding that will be addressed by this particular multi-proxy study. For example, why is it so important to reconstruct environmental dynamics locally? Are there specific/critical problems that the study area confronts with, which could be better understood as a result of this study? Why the lack of continuous palaeorecords in the study area is a drawback? To what extent could the new information gained from this local study be relevant for peatlands in general?

**Author response:** We added justification for the importance of high-resolution paleorecords in the Thuringia region.

**RC:** In the second paragraph of the introduction, we learn that 'peatlands are expected to be vulnerable as the climate currently changes' and that 'it is crucial to investigate the past vegetation dynamics and peat accumulation in response to past environmental drivers to better understand how they will respond in the future and how this will affect their carbon sink function'. Yet, I feel that, by the end of the manuscript, the link to these general ideas is not clearly shown.

**AR:** We have removed this sentence as the general idea is indeed not truly linked to the aims of the paper.

**RC:** In Fig. 1, I assume the peatland area is delimited by the continuous white line (please add this in the caption). Then, what do the blue horizontal line symbols represent?

**AR:** The blue lines have been removed and the caption has been adjusted.

**RC:** Lines 215-236. Add parentheses in the formulas, to indicate the order of operations. For example, it is  $(C22+C24)/(C26+C28)$ , and not  $C22+C24/C26+C28$ , and many others.

**AR:** We have added parentheses where necessary to the formulas.

**RC:** Section 3.2. For consistency, I would recommend presenting the results for the elemental analysis based on zones/phases, like in the case of the other proxies.

**AR:** We have rewritten this section in the style of the others.

**RC:** Section 4.1. It would be great to actually see the how the statistically identified phases among all the proxies compare. Right now, this section is a bit hard to follow. Perhaps an idea would be adding a table on the age/depth scale, with all the proxy categories, proxy phases and major trends in each proxy category for each phase. Or mark phase boundaries for different proxies in the synthesis figure (Fig. 8).

**AR:** Thank you for the suggestion. We have added Table 1 to visualize the differences between the phases and make the section easier to follow.

**RC:** Lines 401-402, 411, 433-435 are results, and should be discussed.

**AR:** We have added discussion for these results.

**RC:** Lines 447-448, 452, 486 – the same idea of recent peatland drying across Europe is repeated three

times. Consider rephrasing.

**AR: Thank you for pointing out the repetition. We have adjusted the text.**

**RC: Lines 495, 496, 503– remind the reader what is the proxy evidence that supports these statements.**

**AR: We have added the corresponding proxy evidence to these sentences.**