Thank you for the opportunity to review for Climate of the Past the manuscript entitled “Holocene climates of the Iberian Peninsula: pollen-based reconstructions of changes in the west-east gradient of temperature and moisture” by Mengmeng Liu and coauthors.

I think that the paper of Mengmeng Liu et al. presents interesting findings in terms of results to be published in Climate of the Past but I also think that it cannot be published in its current version for several reasons.

-My first point concerns the choice of the method to reconstruct past climate changes. You have selected the WAPLS (a modified version of the transfer function): why the WAPLS and not the MAT or BRT? This method is not appropriate here with because the size of your modern pollen dataset (S1) is high and it covers a wide range of biomes and taxa. The WAPSL is useful at local and regional scale but may not be optimal in continental or global scale studies, as the responses of some pollen taxa to the variable of interest can be multimodal (Chevalier et al., 2020) as it is here. Moreover, its better to use a local calibration than a global one: global versus local calibrations (WAPLS) have been investigated in Dugerdil et al (2021). They show that WAPLS performs better for the local database than for global databases. Moreover, in your study, the relative contributions of individual taxa to the reconstructions of MTCO, MTWA and alpha (Table S2) raises some questions: most of these taxa are very rare in the Iberian Peninsula Holocene pollen records (Parrotia, Huperzia, Dryas, Zelkova….). These taxa can be recorded in the modern pollen dataset but are not representative of Holocene south Mediterranean pollen records. In this frame, I strongly recommend to resize your modern pollen dataset (by excluding biomes not recorded in the fossil assemblages or by spatial selection) and to recalibrate the WAPLS with a smaller but more appropriate training set.

Another way could be you need to validate your results by using another climate reconstruction method (MAT, BRT, RF for example) cf Salonen et al. works.

- I strongly recommend to add also regional composite panels (north, central, south?) of temperature and alpha changes instead of a unique composite curve (fig. 3). Regional climate patterns are important (fig 2) and the signal is too averaged if you only look at composite curves. You may miss important signal, so add a discussion about the additional panels and the regional patterns. This is a key point.

-The paper is too short (the description of the modern and fossil pollen datasets is too short, the discussion needs to be improved and some key figures are missing. In its current form, it’s more a report paper than a discussion paper. Many points need further discussion (see below), and this is important because your paper will probably be a key paper.

- I first suggest to better highlight the innovative side of this study. Your work and those of Tarroso et al (2016) (not cited in your paper!) focus on the reconstruction of the climate (temperature and precipitation) in Iberian Peninsula during the last 15000 years from pollen data. What’s new in your paper?

- The paragraph on the modern pollen dataset is too short given that the accuracy of the modern pollen dataset is very important in transfer functions. The ref given for the modern pollen dataset (Harrison, 2019) is not a paper, so more details are needed; how do you calculate the climate parameters? Wordclim1, 2? Chelsea? How do you calculate alpha, which ref? Please add modern values of MTCO and MTWA as you did for alpha (S1). Moreover, the figure with climate values of the training set must be included in the text, not in the Supplementary.

- The paragraph on the fossil pollen dataset is also too short. In the ref cited for the fossil dataset (Shen et al., 2021 CPD) I just found a list of the taxa in the supplementary. It's not enough. Data have been extracted from Neotoma, Pangea, EPD? The description of the data sources of fossil pollen used to reconstruct the climate in the Iberian Peninsula (table S1) must be included directly here in the text and not in supplementary material. Table 1 must be updated with the origin of fossil pollen records: for each site, please add the references of the papers, information about the number of 14C date available, and the temporal range covered as for example, 8000-2000 cal yrs BP (not clear as it is in table S1: what does length mean?). Just keep in mind that without these pollen records you will not be able to provide such regional synthesis.

- The discussion need to be rewritten. **The synthesis figure (S8) must be updated and added in the text not in supplementary**. There is a lack of comparison of your results with the climate parameters available in the Mediterranean area: the study of Tarroso et al (2016) for Iberian Peninsula of course, Dormoy et al (2009) Combourieu-Nebout et al., (2013), Di Rita et al (2018), Jalali et al. (2016) for south Spain and western Mediterranean. It's important to add the curves of Tarroso et al., (2016) which are based on another climate reconstruction method (the PDF) in your figure to discuss regional patterns.

The discussion part on the CO2 impact must be removed, as you work on the Holocene not on the Lateglacial or LGM. You may replace this part by a more in depth discussion on data model comparison (too short!) and atmospheric circulation process.

Other points:

-How do you calculate alpha? A ref is needed. How do you explain values above 1?

- I don't agree with your sentence p 2, line 47 "much of the evidence of the Holocene climates is based on qualitative interpretations of vegetation changes…". A lot of other proxies are available: speleothems, chironomids, alkenones… all give independent **values** of climate parameters.

-- I don't agree with your sentence p 2, line 51 "most of the ca 50 sites from Iberia (Mauri et al 2015) were from the Pyrenees…". Please check and correct: in the Mauri's paper, at least 25 sites of the Iberian Peninsula are not from Pyrenean area and are not extrapolated!

- Some MTWA and MTCO anomalies values are very low for the Holocene period, especially for the last 6 ka: for example, some sites indicate -7° for MTWA (figs S5, S7), it's too low. Could you check your reconstructions?

- Ho do you take into account human impact in your modern and fossil pollen data? Usually we consider that the reconstruction of past climate for the last 2000 years are biased by human impact (check the IPA).

- fig S9: what is PACMEDY, please explain or add a reference.

I realize the authors may find my comments difficult to approach, but I sincerely hope they accept them as well-intentioned guidance. It should not be difficult to address them. Once concerns are addressed, I feel the manuscript will be much closer to being an outstanding contribution to knowledge in this time period.