

Clim. Past Discuss., referee comment RC1
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Comment on cp-2021-174

Anonymous Referee #1

Referee comment on "Holocene climates of the Iberian Peninsula: pollen-based reconstructions of changes in the west–east gradient of temperature and moisture" by Mengmeng Liu et al., Clim. Past Discuss., <https://doi.org/10.5194/cp-2021-174-RC1>, 2021

Summary: The manuscript presents the analysis of a large paleolimnological network in the Iberian Peninsula with records spanning the Holocene. Bases on these records the authors reconstruct the temperature of the warmest and coldest month and a measure of humidity deficit. They conclude that whereas the winter temperatures follow the evolution of the orbital forcing through the Holocene, summer temperatures are fairly stable and do not follow the summer insolation. This finding roughly agrees with other climate reconstructions from these area and diverges from the results obtained with state-of-the art climate simulations. The explanation, according to the authors, lies in the reduced humidity zonal gradient across the peninsula, and the larger alleviate humidity in summertime for most areas, which subdues the effect of solar insolation on surface temperatures.

Recommendation: The manuscript is in my opinion well written and the results are informative. The dynamical explanation of these results lies a bit on the side of - permissible- speculation, as the scope of the study is not a detailed analysis of climate simulations. The conclusions are relevant for climate modelling, as it seems that climate models grapple with a correct simulations of Holocene climate, here and for instances also related to the so called Holocene conundrum . My recommendation, is therefore, of acceptance of the manuscript after a few minor revisions have been considered.

1. line 34

' Projections of future climate change suggest that the region will become both warmer and drier, but nevertheless show that this west-east differentiation is maintained. '

Reference(s) is needed here

2. line 16

'early to mid-Holocene'

Here, and in other instances in the text, the authors use terms like mid-Holocene, early Holocene, present, without having defined them explicitly. In particular, the reference to 'present' is relevant, and the manuscript often assesses Holocene temperatures compared to 'present temperatures'. Is 'present' the 20th average, pre-industrial, around 1950 , temperatures ?

3. line 49

'Although these records are extensive, they seem to indicate fairly complex spatial patterns of change#

I did not understand why the word 'although' needs to be used here. I do not see an implicit contradiction between being extensive and showing complex spatial patterns

4. line 53

Peninsular

line 53

'Furthermore, quantitative reconstructions of summer temperature made at individual sites using chironomid data (Muñoz Sobrino et al., 2013; Tarrats et al., 2018) are not consistent with reconstructed changes based on pollen for the same sites.'

with reconstructed temperatures. Otherwise the sentence is grammatically somewhat odd

5. line 60

'We analyse how these trends are related to external forcing a'

I think the authors refer here to external climate forcing, but the sentence could be misinterpreted as meaning remote forcing, e.g. from the North Atlantic

6. line 93

'We excluded individual pollen samples with large age uncertainties (standard error larger than 100 years)'

What is the typical time resolution of the reconstructions? I think it is no where stated.

7. line 105

'and assessed the significance of differences in these trends through time compared

to 0.5 ka based on p values'

compared to 0.5ka ? It is for me unclear

8. line 141

'Summer temperatures are strongly correlated with changes in δ , δO_2 '

spatially or temporally correlated ?

9. line 158

'their reconstructions show a cooling of 3°C in the early Holocene are comparable in magnitude#

I guess that 'are' should be deleted

10. line 165

'change at some of the individual sites is much larger (ca 10°C) and there is no assessment of the uncertainty on these reconstructions. '

of

11. line 193

'However, they show a persistent cooling of 1.5 °C compared to present between 4.5 and 2 ka, not seen in these reconstructions'

do the authors mean persistent cooling trend or persistent cool conditions ?

12. line 214

'Specifically, the increased advection of moisture into eastern Iberia

created wetter conditions leading to increased evapotranspiration, less allocation of available

net radiation to sensible heating, and resulting in cooler air temperatures.'

I think the authors' point is not necessarily that increased evapotranspiration leads to colder temperatures, but rather to less temperature variations through time and space. The study suggests that summer temperatures did not fall as expected from the solar insolation alone, so this sentence is a bit confusing. Please, clarify.

13. line 222

'Stronger moisture advection is not a feature of the transient climate model simulations, which may explain why these simulations do not show a strong modification of the insolation-driven changes in summer

temperature. The failure of the current generation of climate models to simulate the observed

strengthening of moisture transport into Europe and Eurasia during the mid-Holocene has been

noted by other studies (e.g. Bartlein et al., 2017; Mauri et al., 2014)'

The first sentence is confusing in view of Figure S9. The models do show temperature evolution through time. I think the authors mean that the models are not able to counteract or shield the insolation forcing.

Also, is this conclusion (moisture advection) derived by other studies (then please cite references) or did the authors look into the simulated moisture advection or is this conclusion reached by indirect reasoning ? Please, be here as clear as possible.

14. Conclusion sections

The usual conclusion section is missing. This is to some extent a matter of style (or editorial guideline), but I find useful that a manuscript finishes off with a few bullet-point style list of most important take-home messages

15. Fig S9.

The reader will benefit from a reference to the model runs. I guess that the authors are using the runs described in Braconnot et al. (2019; doi:10.5194/cp-15-997-2019) and Bader et al. (2020;doi:10.1038/s41467-020-18478-6), but please, spell the names of the models in full, e.g. MPI-ESM-P, and give references to the runs used and shown in this figure. Also, some additional information could be useful for the reader as well, such as the spatial resolution.

Also, the time axis is not clear enough : years BP ?