Clim. Past Discuss.,
https://doi.org/10.5194/cp-2019-55-RC3, 2019

Climate of the Past Discussions

Interactive comment on "A new multi-variable benchmark for Last Glacial Maximum climate simulations" *by* Sean F. Cleator et al.

Anonymous Referee #3

Received and published: 28 August 2019

This paper demonstrates a valuable new approach to providing quantitative climate reconstructions based on pollen. This will be very useful for model-data comparisons in CMIP6/PMIP4 and beyond. The main advances here are the consistent and transparent correction for the effects of low atmospheric CO2 on plant moisture use, and the use of a statistical methodology to generate uncertainties and to interpolate spatially and seasonally.

The text is very well written and the figures are clear. However, the paper is quite short and lacks any detailed evaluation of the resultant product. The community's use of this new data product would in my opinion be aided by a more in-depth evaluation of the properties of the reconstruction. It's not clear how important the choices around the assimilation formulation are for the final reconstruction. Specifically the section around

lines 268-278 should in my opinion be spelled out and the sensitivity to these choices evaluated.

The statistical methodology that forms the basis of this study is also not described here but in a arXiv article. I'd like to see more of this brought into the present manuscript to make it self-contained.

Technical comments

Line 127: define MI here.

Line 209: modelsfor -> models for

Line 252-253: I think it might be appropriate to bring some/all of this methodology into the present text, as discussed above.

One question that arises from briefly reading the methodology paper, relates to figure 1 in the arXiv article. Here the assimilation appears not satisfy the pollen-inferred MTCO. Is this because the prior (from the models) is relatively consistent, and so doesn't allow the assimilation to get that cold? Does this happen when applied to the pollen data here? How do we interpret these choices, given that the climate models themselves could feasibly be systematically biased, e.g. through not including aerosols, or using modern vegetation distributions? How have you addressed the possible systematic bias in the models and hence in your prior?

Line 268-276: This section seems crucial to me, but is not clearly described. Please include the mathematical formulation used and a justification for choices made.

Lines 276-278: Do you mean that if the data is too uncertain you mask it based on a 5% criteria? Please could you re-phrase to clarify.

Lines 288: How does your product compare with the original Bartlein et al 2011, and the GCM-based prior? Could you show this?

How well is the seasonality captured and how does it differ from the simulated season-

ality in the GCM prior?

Interactive comment on Clim. Past Discuss., https://doi.org/10.5194/cp-2019-55, 2019.