

***Interactive comment on* “Empirical estimate of the signal content of Holocene temperature proxy records” by Maria Reschke et al.**

Bothe (Referee)

ol.bothe@gmail.com

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Dear authors, dear editor,

First, I have to point to a note on potential conflicts of interest at the end of this review.

Review:

I really enjoyed reading the manuscript by Reschke et al. “Empirical estimate of the signal content of Holocene temperature proxy records” (cp-2018-154). It certainly fits the journal *Climate of the Past* and it is highly relevant for attempts to improve our

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understanding of proxy records and climates from the Last Glacial to the Holocene. It helps us to better evaluate the uncertainty of proxy records and reconstructions as well as comparing paleo data and model simulations.

There are two major comments, that I think should be addressed. Most other comments may be seen more as suggestions. Let me first shortly summarise the more important of my major points.

Your results and how much we can infer from them strongly hinges on the assumptions you make. You state those clearly and discuss them already. You do this in your discussion section. From my point of view it is necessary that you extend on these discussions already when you present your assumptions.

I understand that others may disagree with discussions taking place in the methods-section. Indeed it may be that in a follow up review I say, I was wrong, because the manuscript reads better in this version. However considering this version of the manuscript, the lack of a discussion of your assumptions' appropriateness in the method section clouds the reading.

Major:

1. Section 3.1: Let me extend on my short summary. First, I think your assumptions are reasonable and well stated and do not invalidate your approach. However, they also can invite strong criticisms. You counter these mostly later in the manuscript, but I think you have to show early that you are thinking about this and why the assumptions are appropriate.

A number of questions you should probably deal with early on are, for example: Aren't models thought to be more homogenous than observations? Isn't it unlikely that the proxies really recorded the same 4D-signal? Less important is possibly, whether you can really capture the uncertainty about the signal in the simple estimates you take.

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2. Reference to Reschke et al. (particularly page 6, line 2): Please provide some information in the methods section or at least in an appendix on the method (not least since Reschke et al. is not openly accessible).

Minor:

General: Maybe mention your focus on the last 6kyr already in the title or at least in the abstract.

Abstract:

Suggestion: Maybe rethink the abstract to clarify how you proceed (e.g., page 1, line 17 and following). That is, state which simulations you use before mentioning how they influence the results, or don't mention the specific models at all but just highlight the contrasting results.

Suggestion: Mention the use of the correlation structure before discussing its influence.

Introduction:

Page 2, line 9: If I understand your point correctly, this is not only about non-climatic influences but also about climatic influences different from the specific signal we are interested in.

Data:

Page 3, line 12: You possibly should introduce the abbreviation for Methylation of Branched Tetraether - or simply skip mentioning them.

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Page 3, line 24: Please discuss, why annual temperature is an appropriate choice.

Page 4, line 3: Are all the mentioned forcing factors really continuously transient in the simulation?

Method:

Page 5, line 8: Can you please provide slightly more information for what this reference is here? I do not directly see how it relates to the sentence.

Page 5, line 13: What do you mean by resampled in this context? Further, could you give more details on your block averaging (e.g., block length).

Suggestion: Page 5, line 16, "For each...": I am not sure whether this description gives the reader enough information to redo your analyses. But I am neither sure that it does not. Maybe rethink this.

Page 5, line 20: Please give some more details here on what your reference work describes in this context.

Results:

Suggestion: Page 6, line 25: Would you be willing to discuss how realistic you regard the simulated correlation coefficients, and, possibly, how this may affect the relevance of your SNRs, e.g., if we assume the simulated correlation coefficients are not realistic.

Page 7, line 20: Maybe you should be more explicit in writing about the results for T21k (see also short technical comment below).

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Discussions:

Suggestion: I think it would be interesting to be more specific in what your results imply for interpreting the proxy records and derived larger scale reconstructions. And what it would mean, if your results are either too pessimistic or even too optimistic.

Suggestion: Page 8, last paragraph: Are there potentially other reasons that may result in higher correlations, e.g., how the models are built. Did your department's earlier work hint to any further explanations, or did the PAGES project CVAS come up with some additional explanations?

Page 9, line 7: Do I miss it, or do you omit to specify "N".

Suggestion: Page 9, line 18: Maybe make the points of this paragraph already stronger when you present the results.

Suggestion: Page 10, line 1: Can you discuss, how assuming a more appropriate seasonal and depth choice would influence your results?

Page 10, line 1: Isn't the work of Jonkers and Kucera and further of their colleagues relevant here?

Page 10, line 1: I may be wrong, but I think, the work of Jessica Tierney and colleagues on TEX86 calibrations is relevant here.

Conclusion:

Suggestion: Page 11, line 18: I think you could be more explicit about the relevance of your work.

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Technical:

General: I don't mind seeing "years" written out instead of abbreviated. At least in the abstract I think it would be better to write "400 years" instead of "400y".

Page 1, line 18: Maybe skip "rather"

Page 1, line 20: If I understand the sentence correctly, the second "SNRs" plus its article is superfluous.

Page 1, line 24: I don't think the first sentence of the paragraph is necessary.

Page 4, line 1: If I understand the sentence correctly, it is incomplete.

Page 4, line 7ff: Does this sentence and the next refer to both models or do you mean that you use for TraCE all three mentioned variables? Please clarify.

Page 7, line 19 "differ ..": Please clarify: do you mean they differ between the two simulations?

Page 7, line 20 "consistent with": Please clarify: Do you mean they are consistent with the model or they are consistent in the analyses using this model.

Note on Potential Conflicts of Interest:

As already communicated to the editor prior to agreeing to review:

The journal's guidelines note the following as potential conflicts of interest.

- Reviewers are currently collaborating with an author or have done so recently.
- They have published with an author during the past 3 years.

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- They currently hold or have recently held grants with an author.

I and the co-author Laepple are currently part of the same working group and even work package within the German project PalMod (www.palmod.de).

I and the co-author Rehfeld are currently part of the proposal for the follow up phase of PalMod within the same working group and even work package.

I and the co-author Rehfeld co-authored two (non peer-reviewed) meeting reports this year.

Yours sincerely,

Oliver Bothe

Interactive comment on Clim. Past Discuss., <https://doi.org/10.5194/cp-2018-154>, 2018.

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