

## ***Interactive comment on “Inconsistencies between observed, reconstructed, and simulated precipitation over the British Isles during the last 350 years” by Oliver Bothe et al.***

### **Anonymous Referee #3**

Received and published: 12 June 2018

Summary: The manuscript involves a comparison of climate model simulations with an ensemble of global and one regional model to long observationally-based records and two paleoclimate reconstructions. Little consistency is found between time histories of these records, suggestive of a large role for internal atmosphere-ocean variability. Importantly, while there is little agreement between the characteristics of the model simulations and the observationally-based records, these differences do not appear to be systematic across models and cannot be explicitly linked to model bias. Likewise, there appears to be even less agreement between the characteristics of the observationally-based records and the reconstructions. Together this work is consistent with mounting evidence that regional hydroclimate is largely “unforced”.

C1

General Remarks: While the manuscript is interesting and highlights some important results, it is at times unclear what should be taken away from the results. This is, in part, an issue with the introduction and a refocused introduction that clearly describes the motivations and goals of the study would greatly improve the manuscript. Below are a number of specific and more general comments.

Page 1, Line 8: and in the standard deviations seems a weird statement.

Page 1, Line 18: add “of” before “whether”.

Page 1, Line 19: what is meant by requires consistency?

Page 1, Line 21: suggest changing to “over approximately the last 350 years”.

Page 2, Line 2: suggest removing “in particular”.

Page 2, Line 6: change “base” to “basis”.

Page 2, Line 10: change “compare directly” to “directly compare”.

Page 2, Line 12: Cooper and Wilson et al. are the reconstructions. I would be careful here and throughout with the semantics of “data”.

Page 2, Line 16: You argued in the paragraph above that you do not want to use gridded reconstructions. I understand that this paragraph is addressing a new issue but the reference to the OWDA thus seems unusual here. In general, this paragraph does not seem necessary. I might instead start at the beginning of the next paragraph and add a statement at the end of that first sentence saying that you are doing the standardization to make the reconstructions directly comparable to SPI.

Page 2, Line 24: Suggest changing “their data” to “the utilized archives”.

General comment: A lot of the above reads much more like a methods section than an introduction. I suppose this is more of a personal preference but the paper might be more impactful with a standalone introduction that does not include this methodological

C2

information.

Page 2, Line 24: The sentence about Murphy et al. (2018) feels out of place. I would try to tie this into the paragraph above or remove it.

Page 2, Line 28: Suggest removing “than in periods that are more recent”.

Page 2, Line 29: Suggest splitting the sentence after the Maunder Minimum dates. I would then reword as: “Instead, they generally start around the late 18th century, when sunspot numbers indicate a period of relatively strong solar activity (Clette et al., 2014), and thus also include the transition. . .”

Page 2, Line 35: Suggest changing “in European subdomains” to “across Europe”.  
Page 3, Line 1: Change “extend” to “extent”.

Page 3, Line 10: This sentence is long and the second half I had trouble understanding. Perhaps you could split this up into two sentences and expand on the point that you are trying to make in the second half of the sentence.

Page 3, Line 20: Suggest “using the global model ECHO-G for boundary conditions” instead of “externally forced”. I am also not sure what this part of the sentence means: “and reconstructions over larger regional domains.”

Page 4, Line 1: Suggest changing “and the simulation data representing” to “and simulations that often represent”.

Page 4, Line 2: Suggest changing “evaluation” to “comparison”.

Page 4, Line 17: Change “allows comparing” to “allows for the comparison of”.

Page 4, Line 19: Change “allows evaluating and comparing” to “allows for the evaluation and comparison of”.

Page 4, Line 22: Suggest changing “extends the available metric for assessing the agreement in” to “allows for the rigorous comparison of”.

### C3

Page 4, Line 23: Suggest changing “not only for periods without but also with” to “for periods both with and without”.

General comments on introduction:

I am unsure about the relevance of short-term (decadal) relationships between temperature and precipitation with those expected as a result of climate change (first two sentences of the introduction). The relationship between hydroclimate and temperature at the end of the 21st century in climate models is largely due to evaporative demand, which has a first order impact on water storage but not necessarily on precipitation. These changes are also very large in magnitude, and co-occurring with large magnitude changes in plant physiology, making deeper-time paleoclimate comparisons more appropriate for evaluating climate models (e.g., Scheff et al., *J. Clim.*, 2016). I do not think this precludes such analyses being useful, I am just unsure of using the relationship between temperature and precipitation with an eye towards climate change as the motivation.

I would be careful with the semantics of the word data to make sure that things are as clear as possible. Likewise, I would refer to reconstructions, observations and simulations each with a single consistent term. This applies to the entire manuscript.

The introduction bounces around a lot, with quite a bit of methodology (see general comment above). I think that as cast it will leave the reader uncertain about the motivations and goals of the study. I suggest that the authors revisit the introduction with an eye towards clarity.

I made an effort to make grammatical edits in the introduction but likely missed some. I will not be able to make this effort in subsequent sections but suggest that the authors revisit the manuscript with an eye towards grammar and syntax. It might be worth explicitly outlining how what you are doing here is different from Gómez-Navarro et al. (2015). Along with what is described the methods there would appear to be quite a bit of overlap.

### C4

Page 4, Line 28: Change to “in the form”.

Page 5, Line 15: Suggest adding “In particular,” at the start of this sentence to link it to the previous sentence. Suggest also changing “different means” to “systematic differences in the values of”.

Page 5, Line 16: Suggest “While model-biases may also contribute to these differences, . . .” and change “bias” to “source of differences”.

Page 5, Line 17: I doubt it matters but why the different domain here?

Page 5, Line 30: Change “to include” to “the inclusion of”.

Page 6, Line 5: Change “allows to compare” to “allows for the comparison of”.

Page 6, Line 19: Change “allows considering the changing amount of precipitation” to “allows for a robust quantification of changes in precipitation amounts between subsequent periods, for instance”.

Page 7, Line 2: Remove “just”.

Page 7, Line 3: Add “the” before “time series”.

General comments on methods:

The half-degree simulations are coarse resolution for a regional climate model. At least one of the last millennium simulations analyzed is one degree (CCSM4), how much added information do we expect from a regional simulation at this coarse resolution and what physical processes is it capturing to provide that information?

Page 7, Line 13: Change “tentative” to “qualitative”.

Page 7, Line 20: Suggest change the last sentence to “This is likely to also impact our analyses of precipitation”.

Page 7, Line 32: What is the European domain?

C5

Page 8, Line 2: Suggest removing the first sentence.

Page 8, Line 5: Suggest changing “representations” to “time series”.

Page 8, Line 7: Suggest removing “but the Southern-Central England data enters it later”.

Figure 2, caption: Why call the Southern-Central England record SW England in the legend?

Page 10, Line 23: Change “allows evaluating” to “allows for the evaluation of”.

Page 10, Line 24: Change “gliding” to “sliding”.

Page 10, Line 25: Suggest removing “partially”.

Page 10, Line 27: Change sentence to read “The moving window transformations show the percentiles represented by a given amount of precipitation over time (Figure 3).”

Page 12, Line 1: Suggest changing “We pointed above at” to “In the previous sections we described”.

Page 12, Line 6: Suggest changing “gliding” to “sliding”.

Page 12, Line 11: Suggest combining these two sentences.

Page 12, Line 12: Suggest changing “Considering” to “In”.

Page 12, Line 15: Suggest removing “correlation”.

Page 12, Line 20: Suggest changing “highly” to “strongly”.

Page 12, Line 21: Why “CET” here and not elsewhere?

Page 12, Line 31: Change “very low frequent variability” to “low frequency variability”.

Page 15, Line 8: Again why the use of “CET” here and not elsewhere?

Page 15, Line 15: Why just atmospheric circulation when coupled variability can also

C6

do this?

Page 15, Line 24: I found this paragraph difficult to understand. The final sentence is seemingly important but I was unclear on what it means. Likewise, I would clarify what is meant by unfortunate earlier in the paragraph.

Page 16, Line 7: Suggest changing “appears” to “is”.

Page 16, Line 23: While this is true, it is unclear how it relates to the other discussion.

Page 17, Line 19L Change “source” to “sources”.

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Interactive comment on Clim. Past Discuss., <https://doi.org/10.5194/cp-2018-27>, 2018.