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Earth System Dynamics
Discussions

Interactive comment on "Millennium-length precipitation Reconstruction over South-eastern Asia: a Pseudo-Proxy Approach" *by* Stefanie Talento et al.

Anonymous Referee #2

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1 Abstract

This work presents a series of Pseudo Proxy Experiments carried out with two families of CFR techniques: one based on Bayesian techniques, albeit with several variations based on on using clustering techniques; and the analog method. The results show that the latter performs worse than the former, especially at decadal time scales. Still, the results generally demonstrate the feasibility of the application this type of technique to produce a gridded hydroclimate product for the South-eastern Asia.

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2 General comment

I find the work interesting and comprehensive. The proposed methods are somewhat innovative (at least the part concerning the clustering techniques previous to the BHM method), and cover an interesting topic with plenty of potential applications. My only important concern pertains the way the analog method has been used. There are many choices that would have an impact in the skill of this approach, and I have the impression that the authors have used those leading to the worst results. I think this introduces an artificial bias in the study, which partly relies on the comparison with this method. Despite this issue, I can only identify some minor points that deserve the review of the authors to include better explanations or corrections.

3 Major comments

I'm surprised by the lack of skill demonstrated by the analog method in this exercise. There exist references where the skill of this approach is remarkable, or at the very least comparable to other approaches. The study by Gómez-Navarro et al. (2015), cited the authors, shows that the analog method performs very similar to BHM. This study is especially relevant because it targets at the same variable, and therefore the results should be expected to be similar. Instead, the present article seems to contradict frontally this reference, which in my opinion is too briefly discussed in the text.

I think the authors should deepen on the the issue of why is the analog method so inferior here. This is an important aspect, as the analog method is used as benchmark. I'm concerned with the fact that the way the method has been applied may not be optimal, or the most sensible, which artificially reduces the skill of the approach, therefore lowering the skill of the benchmark and biasing (positively) the skill obtained with the Bayesian techniques. A major problem I see is the way the pool of analogs

is built. The most important caveat of the analog method is the size of this pool. If the authors wanted to use this approach to create a reconstruction, they shall try to increase the size of the pool. In this case, the obvious choice would be to use the whole LME data. There is no sensible reason for using a single model realisation when there are many more. I do not think it makes a fair comparison with the BHM method, because the analog method could be, if the authors allowed it, much more accurate with no additional computational cost.

I do not fully understand how the decadal reconstruction is carried out. This should be explained more clearly. I guess that the instrumental data is previously averaged, in a fixed number of windows (therefore reducing the amount of data to 1/10th) and then they use it to perform the PPE. Right? Doing so, the authors reduce to a 1/10th the size of the pool of analogs, which again may explain the lack of skill. But again, a more sensible approach would be to use some sort of running means of 10 years, where the same year can contribute up to 10 slightly different decadal analogs. This would not reduce the size of the pool so severely, and would allow having a pool with more subtle variations, able to adapt itself better to past situations.

An important issue barely addressed in the manuscript pertains the computational requirements. In Page 13, line 36 they are briefly mentioned, but I'd like to know more. Is the clustering related to this? Is the clustering, indeed, mostly aimed at the reduction of the computational cost? How does the computational cost in the BHM techniques compare to the analog method? These are important operational aspects with important implications in the applicability of these methods in real reconstructions.

4 Minor comments

Page 1, lines 29-31: What does it mean that "more relevant value is encapsulated" I think this is a severe judgement about the superiority of BHM that is not so clearly

justified.

Page 2: the achronim CFR is defined twice.

Page 3, line 36: “Asia We usie” (dot missing and spelling error).

Page 4: Why is JJA precipitation the only target?

Page 6, line 30: a space after comma is missing here.

Page 7: I do not fully understand the explanation. Shouldn’t μ be a vector with as many dimensions as the number of grid points, rather than a parameter?

Page 7, line 21: If only 63% of time series pass the test, does it mean that in the rest this important hypothesis that BHM relies on is being violated? There is an important fraction of the grid points where this test is not past!

Page 7, line 33: What does it tell us that this assumption is flawed? Should we be concerned? If not, why not?

Page 12, line 5-7: In the same direction that in previous points, I find surprising that Bayesian algorithms are successful, given that in this region the hypothesis of normality, which these approaches rely on, is not past.

Page 12, line 13: why the clustering deteriorates the result? I would expect the opposite: if the method can reduce its complexity, it should be more easily fitted to the data for each subregion.

Page 13, line 12-14: the results for CRPS seem to contradict those for correlation. Does BHM perform better for annual reconstructions (if we trust correlation), or for decadal ones (if we trust CRPS)?

Page 15, line 16: “On other hand” (I think "the" is missing in this expression).

Figure 3: I could not understand how this figure is obtained. How are the latitudinal bands operated? Are all grid points coupled within each band, and the average of the

correlation calculated?

Fig 4 and following. I think it is necessary to include the locations of the proxies to facilitate the identification of skill and its relation to the presence of proxies. Perhaps adding country boundaries would also help in the discussion of the results.

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