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Climate of the Past Discussions

Interactive comment on "The Paleoclimate reanalysis project" *by* S. A. Browning and I. D. Goodwin

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Comments on "The Paleoclimate reanalysis project" by Stuart Browning and Ian Goodwin.

The paper proposes a method to reconstructed past climate that falls in the area between traditional proxy reconstructions and the emerging field of data assimilation. I find the paper incredibly interesting, and the "offline" method appears to offer a lot of potential benefits of data assimilation, while having minimal computational requirements. It is also relatively well written. I do however, have some comments that I think should be addressed and clarified in the manuscript before publication in Climate of the Past.

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Interactive Discussion

Discussion Paper

1/ line 13-14: “After assimilation the LME is highly correlated to almost all included proxy data, and dynamical relationships between modelled variables are preserved”, for the selected fields maybe, but this is not the case for the subtropical and polar ocean due to the long memory of the region. This caveat should be made clear in the revised manuscript. This comes up again on lines 13-15 of page 4164, and on lines 18-19 on page 4165.

2/ line 25, page 4162: seems like the ideal place to redefine the temporal resolution that is being reconstructed.

3/ line 5, page 4163: “Proxy data of varying temporal resolutions are accommodated, including records representing discrete time periods”. How are annual and multi-decadal resolution records accommodated? Are simply linearly interpolated (yes according to line 12-13)? If so the above statement is not exactly accurate.

4/ line 3-5, page 4164: From experience, the longer time period that is averaged, the more the spatial detail is smoothed. The fact that decadal averages are used for the paleo climate data, while annual averages are used for the model suggests that the model fields have a lot more spatial variability than would be expected from the proxies. I tend to think that this average time discrepancy could allow the proxy data to be overfitted? Why do the authors not use decadal averages, as the use of a sliding window (as was done here) means that it would not have a great deal of impact on the number of available analogs.

5/ Line 7-8, page 4164: It is not clear to me what is meant by “to account for seasonality, annual means are calculated from the seasons of proxy sensitivity”. Are you suggesting that in some locations only seasonal averages are being looked at? If so how where the seasons specified and did they vary depending on proxy type and location?

6/ line 12, page 4165: “ensemble spread provides one estimate of uncertainty.” But is unclear how the error bars calculated in figure 4 are calculated, are they representing the 5th and 95th percentiles of the indices calculated from the 50 BMA?

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7/ Section 2.4.2. Are ten year averages of the pseudo-proxies used, while annual averages of the LME model are used for the analogs?

8/ Section 4. I understand what is meant in the initial discussion of section 4, but surely there should be some best version that uses all available proxies, then the tool can be used to back out the importance of individual proxies of various regions and look for robust responsesetc. . . This also comes out again on line 6, page 4176, and raises the thought of waiting for the next iteration? Rewording in both places will help clarify the intended message. Maybe the authors should highlight regions that they are confident in the current PaleoR and dont expect to change a great deal in future iterations?

9/ line 11, page 4174: the realistic forcing of LME, this is definitely one of the aspects that makes this model so useful for the PaleoR analysis, the fact that it includes changes in solar and volcanic forcing and the fact it had a large amount of ensemble members. If this really is a tool to be used as described above, the authors should define/discuss how many analogues are required to generate an accurate reconstruction and what forcings they believe the source model should have. Is the LME the best model choice here?

Interactive comment on Clim. Past Discuss., 11, 4159, 2015.