Climate
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Discussions

Interactive comment on "Technical Note: Probabilistically constraining proxy age–depth models within a Bayesian hierarchical reconstruction model" *by* J. P. Werner and M. P. Tingley

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Received and published: 6 February 2015

We are grateful to have received such a kind evaluation of our article. Just like Michel Crucifix we do hope that the proposed algorithm will be useful in real-world climate reconstruction problems. Regarding the other major concern, we do plan to package the source code together with the neccessary information to run similar tests and prepare climate data as input for the algorithm. We do agree that this helps to provide more technical details than can be covered in the article text, and that it should be common parctice.

In the following we address the minor comments, line by line.

p. 4502 l. 14: 'global-scale climate events' : I would delete the word 'climate', so that tephra layers can be included.

- agreed.

p. 4506 ll. 19-20 : delete 'for details' at the end of line 19.

- I believe we found it, though page and line numbering seems to be different in the online version.

p. 4510 , l. 5 : 'Although formally the full state of the MCMC needs to be swapped, it is equivalent to only swap temperatures'. I could not follow the argument, since the MCMC state also includes the ADM state? Please develop.

- Yes, indeed, the full state of the MCMC does include not only the climate (temperature) estimates, but also that of the parameter. The information on the selected ADM is one of the parameters. We tried clarifying it by explicitly stating it.

p. 4511 l. 2 : 'this leaves enough data for the evaluation'. The casual MCMC user may be lost here. Does this mean that the scores such as CRPS, or Bar Reli are only evaluated far enough from swaps ? One or two more lines of explanation would make the text more accessible to the less specialised audience.

- Indeed, all evaluations do assume a stationary (and unheated) posterior, so we need to discard some steps to fulfil this.

p. 4512 , ll. 4 - 20 : similar remark as above : a reading guide to appreciate what are acceptable CRPS, $CRPS_{pot}$ or $\bar{Reli}$ coefficients would be welcome, otherwise the message of Figure 7 will remain cryptic to many readers.

- We tried to rewrite the paragraph to make it a bit more accessible.

p. 4513 , l. 5 : "weighting by first the prior". Wasn't it the case that the prior is uniform across all the generated ADM samples?

- Yes. And the description of what we did is not clear here. What we meant to write was: showing the L1 distances of the prior dist. (all, unweighted) of the ADMs (left panel), right panel: distribution of L1 dist of drawn ADMs (weighted by posterior = number of times they were drawn).

p. 4517 , l. 21 : the authors propose an adaptation of the algorithm to benthic sediments. The proposal would identify every depth level as a weighted average of states at different times. This is an interesting idea. Wouldn't this require, though, such a dense discretisation of the time domain that the resolution would be intractable?

- It depends on the target resolution of BARCAST. Using benthic sediments, a resolution inside BARCAST higher than a few decades would be unrealistic. Lacustrine sediments on the other hand can provide decadal resolution. Another problem would be that the process level model would need some modifications: While one could argue that the process over the last 2000 years has been more or less stationary (exception shown by change point analysis: a change point around 1909, unfortunately unpublished results by some colleagues), this is no loonger true when approaching the transition form the Holocene optimum (8ky BP?) into the present 'Neoglacial'. We extended the description a little.

p. 4518 , l. 25 : extra 's' at increases.

- fixed.

Legends : Table 2 : clarify CRPS, Reli, etc. , at least by referring to the text.

- Extended.