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Climate of the Past Discussions

Interactive comment on "Assimilation of Pseudo-Tree-Ring-Width observations into an Atmospheric General Circulation Model" *by* Walter Acevedo et al.

Anonymous Referee #2

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Review of "Assimilation of Pseudo-Tree-Ring-Width observations into an Atmospheric General Circulation Model", by Walter Acevedo1 Bijan Fallah, Sebastian Reich, and Ulrich Cubasch

This is a nice study on the assimilation of tree ring width into an atmospheric GCM. It systematically tests several open questions that are relevant to the community using a very simple climate model and assimilation set-up. The paper is well written, though it caters the specialist more than the general reader. It fits very well within the scope of the journal. I recommend publication after some revisions are taken into account.

One important point which I feel is not treated adequately in this paper is the observation error. The authors use a signal-to-noise ratio of 10. Typical pseudoproxy experi-

ments use ratios of 0.25-1. Although the authors mention in the last part of their paper that their signal-to-noise ratio is optimistic, the reader is left wondering what the effect could be. Furthermore, the error model is not well explained. Why white noise? What would be the effect of a spatial error structure? What would be the effect of systematic spectral biases in the tree rings? Even more importantly: Was the error assumed to be known perfectly? These questions would be very important for the community and would probably deserve a dedicated paper, but to the extent to which they could interfere with some of the results presented, I think some discussion should be added.

A second point concerns the model description, which is rather short. In particular, the boundary conditions are not well discussed (e.g., greenhouse gases, volcanic aerosols, etc.). I am aware that this is a Observation System Simulation Experiment, nevertheless I would be interested in the effects of boundary conditions. What are the climatological maps from ECMF used for? And maps of what quantities? The paper is sufficiently short; some more explanations could be added here.

The authors use many acronyms (TRW, PLF, DA, SNR, VSL, GCM, TA, EnKF, CFR, OSSE) which may be familiar to some readers but not to others. Again, I don't think that the paper is too long, and some of the acronyms could be spelled out for the sake of better readability.

The description not only of the methods, but also of the result is rather short.

p. 3, l. 6: Or, covariance matrices may be blended from the ensemble and other estimations.

p. 4, l. 10: Explain t-norms.

p. 6, l. 28: "a fixed averaging period length of one year": How was that year defined? April to March?

p. 7: The reader might get confused with the terms "run" (nature run, free ensemble run) and experiment (PRESCRIBED, SLAB). The table does not help the confusion,

but the Appendix does, it is very well written. Please refer at the appropriate places in the manuscript to the Appendix.

p. 7, l. 21: The low yearly internal variability in the tropics deserves some further attention. What does this mean in relation to real-world phenomena such as ENSO or PDO? This is particularly interesting as the authors discuss the PRESCRIBED set up and the SLAB but later note that fully coupled systems could/should be used. Would the result be completely different in the tropics?

p. 7, l. 25: Just really minor: "Fig. 3a" is arguably more common than "figure 3.a"

p. 8, l.16 and elsewhere: Is the emphasis (bold italics) necessary? The authors use the term in the same way as the literature.

p. 9, l. 18: What do you mean with "any specific year"? Does that mean that the boundary conditions are disregarded? Can 1900 serve as a prior for 1999?

p. 10, l. 13: "a more consistent"?

p. 10, l. 30: There is another important difference to traditional CFR techniques (by the way: spell out), namely that data assimilation at least formally does not require calibration and thus is less sensitive to stationarity issues.

p. 11, l. 1: "full atmosphere-ocean interaction".

p. 11, l. 25: Not only model errors, also the observation error is an issue.

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