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Open Access Earth System Science Data Discussions

Interactive comment on "Simple noise estimates and pseudoproxies for the last 21k years" *by* Oliver Bothe et al.

Anonymous Referee #3

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SUMMARY
Bothe, Wagner and Zorita present code to produce sediment pseudo-proxy time series, i.e. a time series of a temperature variable that originates from transient climate model output and that has been modified in several stages mimicking - statistically - the processes that affect sedimentary palaeoclimate archives.
This is a timely and relevant approach and could prove useful for model data comparison in the near future with more transient paleoclimate model simulations becoming available.

GENERAL COMMENTS
- unclear aims: which properties of the data will be compared? The present formulation

only allows time-mean comparisons.
- downloading and testing the data generation is cumbersome as all parts apparently have to be manually downloaded. It would help to have a provided zip file, and a README on how to get started.

DETAILED COMMENTS
- p1 l4/following: the term "pseudoproxies" suggests that it is possible to hand the code a description of a specific sediment record (including e.g. information on the number/precision/type of dating) and all ensuing uncertainties are considered. This is not the case here, as all terms of non-climatic/insolation uncertainty considered remain statistical and non-proxy/archive specific.
-p2 l26-31: Considering dating uncertainty as purely additive white noise independent of the time axis strongly limits the suitability of the resulting time series. Autocorrelation results from the distortion of the time axis by changes in accumulation rate - which should, in a real proxy record, be captured by dating, and subsequent age modelling. Dating uncertainty represents a large component of the overall contribution to the low signal to noise ratio (c.f. Reschke, Rehfeld Laepple, Clim. Past. Discuss). The net cross-ensemble mean of the dating contribution to the final pseudoproxy uncertainty is zero in the presented formulation, as is the serial correlation of the component. Both is not appropriate. It would be beneficial to adopt (or include/prepare for) ensemble-based age models for the actual underlying proxy records; or if a simplistic solution is desired, to include the more realistic option of modeling age uncertainty by relative squeezing and stretching of the time axis.
- p 3 l30 and following: Why is only summer seasonality considered? Is this a limitation of the pseudoproxy code?
- p4 l3: why this gridpoint? The arbitrariness of this choice somewhat illustrates that it appears difficult to use this code to include knowledge on real-life proxy datasets (e.g. sedimentation rate/dating frequency/ multi-proxy configurations).
- Sec. 3: Please provide a graphical illustration of your pseudoproxy generation (e.g.

using a graphical model).
- p6 l26: Autocorrelation should be considered, as several of the noise components (dating, non-local climate) are expected to be autocorrelated processes. The difficulty will be in actually estimating the true autocorrelation that should be used for the noise process.
- p7 l6: Is the assumption of increasing noise variability with increasing parameter variability appropriate for all noise components? It would appear that larger climatic variations might be recorded more precisely. In the absence of information whether proxy noise is smaller or larger for higher or lower climate variability this term should be reconsidered.
- p7 l22: Can winter insolation be considered as bias?
- p8 l5 and following: How do the processes and results here compare to the approach by Dolman and Laepple (2018)?
- p10 l13: typo original
- p10 and following: The measurement error will depend on the type of sampling. To which degree is the sampling of the pseudo-proxy archive consecutive, overlapping, or spot-wise?
- p13 l12: Consider also the Bayesian Age-Depth modeling methods (e.g. OxCal, Bacon etc) which provide probability density functions of the proxy records.
- Figure 5: Please provide ensemble averages that allow to assess the spectral biases due to the proxy processes more easily.
- Figure 10: The time series are difficult to process and compare by eye. It appears in some cases there is an amplification of the apparent signal in the pseudoproxy record. Why? Where on the globe is the SD of the pseudoproxy > the SD of the climate signal?
- p28: missing section ref.

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