ESSDD

Interactive
comment

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

Anonymous Referee #1

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General Comments

In their manuscript, Bothe et al. provides a flexible approach to take into consideration noise in forward models of paleoclimate proxies, i.e. pseudoproxies. Although the need for these pseudo proxy models is increasing, I'm unclear as of how the present study adds to the growing body of methods available, including the recent SedProxy toolbox of Dolman and Laepple referenced by the author.

I would not recommend the manuscript for publication in this present stage. In particular, I suggest the authors make the following points clearer in their revisions: The work seems to rely on the concept of proxy system introduced by Evans et al. (2013). A proxy system is composed of an archive, a sensor, and an observation (measurement in the present manuscript). Each components can be modeled independently to ob-

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Discussion paper

tain the full proxy system model. Proxy systems model extend to age determination methods and I'm unsure as whether it was singled out in this manuscript. Ideally, in order to fully represent the uncertainty in the proxy, one would want to use a proxy system model for the time axis (e,g, radiocarbon in foraminifera shells) and y-axis (e.g., Mg/Ca in foraminiferal shell). In this particular example, the archive and sensor model would be common to the x-axis and y-axis. The observation model would need to be tailored to the particular measurement. The back and forth between age uncertainties and environmental variable uncertainties in the manuscript is confusing. I'm also unclear on how this model is fully generalizable since each type of observations made on this archive (e.g., Mg/Ca in foraminifera shells or UK37) would have specific "noise" associated with them which would need to be modeled individually. The authors keep referring to "non-climatic noise". Climatic noise is also included in the proxy records and is often impossible to disentangle from the other sources of noise discussed in the manuscript.

Specific comments:

Introduction: The concepts of proxy systems and proxy systems models need to be introduced earlier and a description of how the current work fits into these larger concepts need to be included.

Please also include a discussion on how the present approach is different from the slew of studies on proxy system models and what it adds to the table.

Page 2, line 13: A proxy system is a mathematical representation of the proxy, including the error. How is this a second way. I'm also unsure how the noise is not observation-specific? Page 2, line 30: How is a probabilistic description not a way to capture the error?

Page 4, line 3: Why choose an arbitrary point on the map? Why not a place where it would be possible to have a sedimentary record in the first place (ocean or lake)?

Page 6, line 14: I'm rather unclear about "Bias at the reconstruction level"? Aren't all sources of noise and biases important the reconstruction level? Also how can seasonality not be considered sensor uncertainty?

Page 7, line 18: The change in noise level is not obvious at all. Page 7, line 22: What three versions? Since it seems to be important, could you describe them?

Page 17: Why use the Lomb for comparison? It is know to have a bias in the high frequencies. The WWZ transform might be a better option for unevenly-spaced datasets.

Page 17, line 27: In pseudo proxy experiments, something needs to be used as ground truth would it be reanalysis data, instrumental data or in the case the TracCE-21ka output. I'm unclear as how these peaks are spurious rather than "the proxy didn't capture them."

Page 19, last three lines: I agree that a process-based model would be more useful and they are fairly simple to implement. Hence, I don't understand how the noise approach presented here is useful.

Technical corrections

I would also suggest editing the manuscript for English. For instance,

Page 2, line 3: "as base of the comparisons". Do you mean "as a basis for comparison"? Page 2, line 4: "a, eg. Temperature reconstruction and the model" is clearly missing words.

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