Climate
of the Past

Discussions

EGU

Interactive comment on "Does a proxy measure up?: A framework to assess and convey proxy reliability" *by* F. Garrett Boudinot and Joseph Wilson

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We thank this anonymous referee for their thoughtful comments, which highlight the applicability of our manuscript to the Climate of the Past audience and provide suggestions to improve the scope of the paper.

We use a suite of temperature measurements and proxies as case studies to demonstrate that uncertainties associated with proxies could be better represented, and potentially accounted for. We provide specific language to guide such representation, including the novel terms confounding causal factor, controlled measurement, and inference- and observation-constrained proxy. While we agree that most paleoclimatol-

ogists are well aware of these ideas, the lack of codified language to represent these ideas has remained a barrier to open discussion of the subject. As such, we do provide clear suggestions for future discussions of proxy uncertainty. While our goal is not to provide a "tangible way of tacking the uncertainties in proxy systems," we do see that as an objective that could be met using our proposed framework in the future.

The referee provides many opportunities to improve/clarify our discussion and expand the scope of our work. For example, we agree that paleotemperature proxy is a useful replacement of the term paleothermometer. While our explicit in-text definition of paleothermometer (lines 65-66) situates our use of the term throughout the text, paleotemperature proxy can easily be substituted, and indeed highlights the proxy association that is crucial to our discussion. We will modify the revised manuscript accordingly.

We are also happy to include the provided references on transfer functions and proxy system models, which indeed have contributed to the assessment of uncertainties and CCFs during proxy development. The incorporation of those will certainly help to demonstrate the rich history of existing methods for developing proxies and reducing the effect of unknown CCFs.

We will certainly include further discussion and examples of inference-constrained proxies as they relate to observation-constrained proxies in the revised manuscript. Similarly, a "glossary" of proposed terms as suggested by another referee should help communicate the distinction between the two.

Other points of clarification needed in the text, including lines 342 and 409, are well-received and will be modified accordingly in the revised manuscript.

While we feel that an extensive discussion of digital thermometers is not necessary for our case-study approach to describing our framework, we are happy to briefly incorporate digital thermometers by situating them on our spectrum where appropriate. Indeed, it fits within our framework and helps to provide context to the proposed framework.

We are happy to revise Fig. 3b to improve its clarity. However, as noted in the text (lines 272-290), the existing literature currently lacks a unified assessment of uncertainty, limiting the construction of a quantitative y-axis. Modifications to the figure for the revised manuscript will, however, include y-axis descriptors to clarify the ideas presented there.

Finally, while the reviewer may consider a distinction between proxy and indicator, we see the latter as too broad a term. Our distinction between quantitative and qualitative proxies serves the same function, and is more clear than introducing a new, broad term such as indicator. We do appreciate this comment, however, as it helps to focus and clarify our language used throughout the text.

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