# *Interactive comment on* "How large are temporal representativeness errors in paleoclimatology?" *by* Daniel E. Amrhein

**Dan Amrhein**

amrhein@uw.edu

Author Response

R1 *This study addresses an important issue, which often is forgotten in the paleodata comparisons. Paleoclimatic measurements are usually dated and mostly dating uncertainties are communicated, too. However, depending on the archive and sample methods, measurements are often time averages, integrated over a specific period. This averaging period needs to be taken into account if these measurements are compared to simulations or other observations with different averaging periods. This study makes an important contribution to quantifying this error source.*

C1

*The topic is highly relevant for Climate of the Past, ideas are novel and substantial conclusion reached. I found the figures, which introduce the basics concepts, very clear and helpful illustration. However, I assume the level of text and presented mathematical background goes beyond the average reader of this journal. Therefore, I suggest major revision, which should mainly simplify the entire text, to make it clearer and more accessible to a broad audience.*

I appreciate the comments of Reviewer 1 and their support for the relevance of the work. One of my goals in writing this paper is to make some of the machinery of time series analysis, which I found important and insightful for thinking about problems of what proxies represent, relevant and accessible to the paleo community, so I welcome ideas on how to improve this.

Reflecting suggestions from both reviewers, I plan to modify the paper to emphasize a simplified mathematical description of the errors, motivated by a minimal working example that will motivate key concepts. The bulk of the derivations, which I hope could be of use to the growing community doing this sort of uncertainty quantification, will be moved to the appendix.

*- Line 11: Many expressions have not been introduced, yet and are therefore not clear to the reader. What is the "target interval". Better avoid abbreviations like "tau" in the abstract.*

I agree that these abbreviations are unnecessary in the abstract, and will define the terms more clearly.

*- Line 13: What is meant by "archive smoothing" and "anti-aliasing"?*

Archive smoothing is defined (later in the paper) by noting that

"In many cases, paleoclimate archive are smoothed prior to processing by bio-turbation, diagenesis, residence times in karst systems upstream of speleothems, or other effects. These processes can be complex and non-constant in time..."

Clearly a similar definition would be appropriate in the abstract and introduction.

*- Page 2, lines 3ff.: I would suggest bullet points for the various error sources*

Thank you, good idea.

*Fig. 1: Great, this makes the problem easily accessible.*

*Table 1: This looks more like the variable list of the 500-page book than for a CP article. It may help to have reduced (basic) version of the mathematical background in the main part of the paper and the derivations in a supplement.*

I would be glad to shift the balance towards the less technical in the main text to improve accessibility, and move this table to an appendix.

*Page 6, line 1: "boxcar" needs to be explained*
*Page 6, line 6: over over*
*Fig. 3: Labeling too small*
*References: Latex code remained in the pdf version.*

Thanks for these additional points, which I am happy to address.