

Clim. Past Discuss., referee comment RC1
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Comment on cp-2021-145

Natasha Barlow (Referee)

Referee comment on "Assessing uncertainty in past ice and climate evolution: overview, stepping-stones, and challenges" by Lev Tarasov and Michael Goldstein, Clim. Past Discuss., <https://doi.org/10.5194/cp-2021-145-RC1>, 2022

I have been asked by the editor to review this manuscript as a 'data person'. I feel it is necessary to summarise my background here to provide context for my review – I have had no formal mathematics training since the age of 16, focusing my studies on geography and biological sciences. I have 15 years' experience of field and lab-based geoscience since the start of my PhD, focusing on reconstruction of past RSL change. I have worked with models, model outputs and the modelling community, but I would not call myself a modeller.

The reason for this summary is that it is important to understand the background of some of the suggested readership. The authors state that "This overview is intended for all who are concerned with either inferring past ice sheet and/or climate system evolution or using the results of such inferences (be they modellers, data gatherers, or mongrels). Our goal is that after a careful read, you will at least be able to more critically evaluate uncertainty assessment for such contexts." From my own personal perspective, as a data gatherer, I am afraid I am unable to realise the authors stated goal. The paper is likely of use to those with mathematical training, for example postgraduate palaeo modellers, but for those of us without this background, much of the paper is inaccessible as it heavily utilises mathematical jargon and equations. For example, in outlining what Bayesian inference is, the authors by page 5 include lines such as "To be consistent under various sets of natural axioms, the conditional probability $P(A|B)$ can be defined as the quotient of the joint probability of A and B, $P(A,B)$, and the probability of B, $P(B)$ " followed by equation 2. I am going to have to admit (in open review!) I had to ask a postgraduate modeller what the "|" notation means (though the authors do state it in line 115, it is not clear to a non-expert that conditional probability refers the whole of the equation or the | notation) and then search for several of the terms in the text; by equation 3 I was incredibly confused.

I have read the whole manuscript, but have been left very lost, rather than informed. This is not a reflection on the authors work, but rather how it is written relative to my experience and training (which is very different to the background of the authors). However, if the authors really do want to achieve their desired goal of assisting the palaeo community in better understanding and quantification of uncertainties, the paper needs to

be written in a far more accessible way; or the pitch needs to be altered as a paper for targeted to modellers rather than the wider palaeo community.

If the goal is to upskill the wider community, the paper would benefit from a very simplified introduction of the concepts with supporting figures, rather than equations (some of which could be moved to a supplementary for those who wish to study them) with less technical jargon; followed by worked through examples (again with supporting figures) to aid the communication to a much wider audience. I agree with authors in line 1365 that we need better understanding of observational uncertainties, but as the authors state "as none of the above uncertainties are likely to be well represented by a Gaussian distribution, the efficient representation of the uncertainties for likelihood application also needs consideration". Addressing this requires clear and simple communication between those with extensive mathematical experience and those without, which this manuscript as presented does not currently help achieve.

Alternatively, if the paper is to be targeted to palaeo modellers specifically, I would think section 4 is a key take home for the paper, and may be of value to this community whom likely already have some understanding of the opening Bayes introduction.

Given the above, I find I cannot comment on the content in detail – but instead provide a wider reflection of whether this paper actually achieves what the authors had hoped?

Some minor comments:

- In additional to the HoISea database, I would add reference to the WALIS database by A. Rovere et al <https://warmcoasts.eu/world-atlas.html>. Though previously LIG focused, there is currently efforts to migrate the Holocene datasets into this same interface which address some of the comments by the authors in section 2.10
- Line 195 and 201 there are hanging ... which need replacing.
- Line 828 : at the end of the title need removing
- To make this as useful as possible, the framework in section 4.1 might be supported by a flow diagram/table.
- Line 1241 - ? at the end of Briggs reference needs removing.