

Interactive comment on “On the origin of multi-decadal to centennial Greenland temperature anomalies over the past 800 yr” by T. Kobashi et al.

Anonymous Referee #2

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The paper sets out to investigate how a newly derived temperature reconstruction specific to Greenland compares to two Northern Hemisphere proxy reconstructions. The authors hypothesize that anomalies between the Greenland temperature reconstruction (GTA) and the background Northern hemisphere temperature are linked to solar driven variability in NAO/AO-like pressure pattern, where the important observation is the negative correlation between solar activity and GTA. The authors do a fairly convincing job of presenting evidence that support this hypothesis, based both on the observed correlations in their data treatment and on the physical processes implied by the modeling efforts. However, the authors also point to a role for AMOC in the GTA, but there lacks a clear discussion of the relative importance of oceanic and atmo-

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spheric circulation to the observed variability in the GTA. In a similar way, the authors wish to separate the effects of volcanic and solar forcing, but as a reader I was left with an unclear picture of if this was actually done. Thus, an expanded discussion could be helpful in the context of the paper's aim to show the potential to differentiate between the effects of volcanic and solar forcing for GTA. Nonetheless, this paper is certainly relevant to the “Climate of the Past”, and could be published with corrections and clarifications. In addition to its impact for understanding the controls for surface Greenland temperature with an eye toward mass balance predictions, as with its companion paper, this paper should be of interest and value to the community trying to understand proxy-temperature relationships from ice cores.

General comments:

One improvement concerns the language. While the paper is organized logically for the reader, at times the flow of the language and sentence structure is clumsy and requires a second or third pass to sort out what is being said. In particular the use and placement of parenthetical materials should be reconsidered.

Concerning the GTP term (discussion including P 5462, lines 15-28), is it possible to state more explicitly in the text the magnitude of the responses expected for a given change in solar activity, or whether it is even possible to estimate them, and to which degree of certainty? This is somewhat addressed/implied with the discussion that follows with the synthetic time series, but I am left with questions as a reader. I was not able to extract this easily from the Appendix materials or figures. Is it assumed that the relative responses to solar forcing are faithful through time, and if not would the authors also consider changes in the relative magnitude of the responses to reflect “non-linear climate responses to solar...forcing” as implied on p 5463 lines 3- 4?

P 5461, lines 10 and 11. The authors state that the similarity of the two derived GTAs indicates the robustness of the GTA signal. This seems overstated as it is also simply due to the similarity of the two NH temperature estimates.

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Figure 3: I find the relationship between the coloring and the text confusing. Because of the reverse axis, the use of “above” and “below” to describe values relative to zero has different meaning. In panel (C) above zero corresponds to negative GTA, while in panel (D) above zero corresponds to positive numbers. Furthermore, the color blue in panel (C) is used to represent a warm temperature anomaly. I could offer that the colors be switched in panel (C), where a warm anomaly not be colored blue, which might further highlight the author’s point of the observed negative correlation between solar activity and GTA.

Technical comments:

“TSI” should be defined in the text

P 5458, line 8. “...features resembling to the...” remove “to”

P 5460, line 10. The authors refer to Figure 1, middle panel. There is no middle panel.

P 5461, line 6 and 7. Suggest replacing “the characters” with “characteristics”. Add comma after 1450.

P 5461, line 18. Add a “.” after period.

P 5463 line 2. Add a space between millennial and scale.

Interactive comment on Clim. Past Discuss., 8, 5455, 2012.