

***Interactive comment on* “The effect of precipitation seasonality on Eemian ice core isotope records from Greenland” by W. J. van de Berg et al.**

Anonymous Referee #2

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Review of "The effect of precipitation seasonality on Eemian ice core isotope records from Greenland" by van de Berg et al.

This manuscript presents a set of regional climate model simulations for Greenland for present, pre-industrial, and Eemian climate analyzed with respect to condensation temperature. The authors argue that despite small simulated changes in surface temperature condensation temperature can be more strongly affected by seasonality. In general I find the study interesting and scientifically valid. I have some reservations about the wider implications of the findings due to the condensation temperature approach. In addition the presentation of the material could be improved.

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Main comments:

1. The title claims that the manuscript investigates "the effect of precipitation seasonality on ice core isotope records from Greenland", but I don't see this sufficiently dealt with here to use it as a title. It seems something along the lines of "Why precipitation seasonality could be important to interpret Eemian ice core records from Greenland" would be more appropriate.

2. More details on the Eemian climate as simulated by ECHO-G should be given in the paper. How strong is the decadal variability, and how relevant is it for this analysis? How was this particular analysis period chosen, and have you compared to another 30yr time period? How persistent is the negative SST anomaly W of Greenland shown in Fig. 4 in the Eemian climate simulation, and how relevant is this for your downscaling experiment?

3. As the authors are already aware, condensation temperature is only one part of the processes governing isotopic fractionation. When interpreting condensation temperature as an isotope proxy you basically make the assumption that changes in atmospheric transport can be neglected. I find this a rather strong assumption, since with changing seasonality it could as well be expected that the atmospheric transport patterns change, e.g. due to different cyclone tracks. This implicit assumption should be more clearly stated and discussed in the introduction and conclusions.

4. Why is it necessary to separate some material into a supplement? Consider shortening the description of the present-day climate which contains many obvious statements and incorporating the relevant figures from the supplement into one coherent manuscript.

Detailed comments:

Pg. 271, L. 23: Not clear what you mean by "moisture source elevation", the moisture source should be at the surface. Do you mean "condensation altitude"?

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Pg. 272, L. 5: A discussion of major point #3 could be included here. See Sodemann et al., JGR, 2008 for a detailed analysis of the influence of changing moisture trajectories for isotopes in Greenland precipitation.

Pg. 273, L. 25: How large was the simulation domain for the regional model?

Pg. 274, L. 11: word missing after "very"

Pg. 274, L. 20: use a weaker formulation for "must have been"

Pg. 274, L. 24: correct to "stable water isotopes"

Pg. 275, L.9-11: These two lines should be deleted. None of this is shown here and thus also nothing demonstrated.

Pg. 276, L.1: Tz is a mean temperature with respect to time or space?

Pg. 276, L.4: Not clear what is meant by "the mean atmospheric temperature". At what level?

Pg. 277, L. 14: Rephrase to "no stable BL..."

Pg. 278, L. 20: Add "(not shown)"

Pg. 270, L. 22: an important contributor to the warming is warm-air advection, e.g. in a cyclone's warm sector airmass

Pg. 282, L. 5: rephrase "outspoken", use an adverb

Pg. 282, L. 6: how robust are such ocean circulation changes, as they can be quite influential for the climate in Greenland?

Pg. 283, L. 5: "small but clear": formulate more quantitatively

Pg. 283, L. 9: "wet": clarify or define

Pg. 285, L. 4: insert "in Greenland" after "climate".

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Pg. 285, L. 5: "biased high": not sure what you mean. Biased high in your model compared to observations?

Pg. 285, L. 6: "mostly influenced by summer precipitation": I am not convinced that this statement is true in its broadness.

Pg. 285, L. 27: "the results . . . are deterministic": rephrase, avoiding the use of deterministic here.

Pg. 286, L. 7: Weaken the statements in sentences after "This study. . ."

Interactive comment on Clim. Past Discuss., 9, 269, 2013.

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