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Climate of the Past Discussions
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Interactive comment on "Greenland accumulation and its connection to the large-scale atmospheric circulation in ERA-Interim and paleo-climate simulations" *by* N. Merz et al.

Anonymous Referee #1

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This paper examines accumulation over Greenland and its potential changes during different climate states, in particular Early Holocene (EH) and Last Glacial Maximum (LGM). The authors analyzed both thermodynamic and dynamic factors that drive accumulation changes over Greenland.

Some of the results of the paper are already known and the authors should make clear what are the new results coming out from this study (starting from the abstract: see General Comment #2), which can represent an interesting addition in understanding the changes in Greenland accumulation in different climate states. I think this paper may be suitable for publication in CP after addressing the following comments.

General comments:

1) The authors has pointed out several time as one of their results that “accumulation records from different ice cores sites cannot be expected to look alike since they include a distinct local signature”. I found this statement imprecise: first of all, the authors do not specified on which temporal scale this statement holds true: daily, monthly, interannual, decadal, centennial. Second of all, I would not expect at all, that proxies that are hundreds km apart, with complex orography in the middle to look alike on daily, monthly or interannual timescale. On the other hand, I do expect to be similar on centennial/millennia time scale. Hence, if one is trying to reconstruct the NAO variability of the last few centuries, he/she needs to be careful on the choice of the location of the ice-core and on the local signature, whereas if he/she cares about millennia oscillation I would expect that NGRIP and DYE3 are synchronous and are telling the same story.

2) The abstract seems more an introduction than actually a resume of the main results of the manuscript: it is difficult to understand what is new and why this paper is relevant. I invite the authors to better stress what are the main results and the novelty of the paper.

3) The stability issue on interannual time scale has been addressed on other studies that the authors should refer to, in particular: Langen and Vinther 2009 (Clim. Dynam.) where they analyze the response in northern hemisphere atmospheric circulation and the resulting changes in moisture sources for Greenland precipitation to LGM boundary conditions using an AGCM. Pausata et al. 2009 (CP), where they show in a model intercomparison set-up the changes in seasonality for 2 different locations in Greenland as well as the effects of changes in the leading mode of the atmospheric circulation in terms of potential recorded temperature and precipitation between PI and LGM. Kim, 2004 (Clim. Dynam.) and Pausata et al. 2011 (CP) show the impact of different boundary conditions (topography, GHG, etc) in altering atmospheric circulation. I would invite the authors to include those references in the introduction and/or when discussing the stability during past climate changes.

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Minor Comments:

a) Abstract: L10 delete “on” in “. . . on on various . . .”

b) P3830 L1: I assume the authors mean that they use prescribed SST when they use the expression “a data input model”. If so I would suggest to use “prescribed SST” is less confusing.

c) P3830 L9: pre-industrial simulations as well as the GHG concentrations used in your paper refer to the year 1750 not 1850, please change it.

d) P3836 L4: “not shown”: Aren’t the sublimation rates shown in Table 2?

e) P3844 LL21-23: why the low pattern correlation in EH8ka would be due to a “deviating signal in a far-afield areas”? If so I would expect to see this effect also in the other EH or the LGM simulations? Please, explain better.

f) P3844 LL23-25: where is it shown that PD patterns over Greenland compare well to EH8ka patterns? Please specify.

g) P3846 LL23-35 and P3850 LL13-17: see General Comment #1.

h) P3848 LL17-24: the authors could refer/discuss the papers or some of the papers suggested above.

i) P3850 LL13-17: see General Comment #1.

Interactive comment on Clim. Past Discuss., 9, 3825, 2013.