

Interactive comment on “Small impact of surrounding oceanic conditions on 2007–2012 Greenland Ice Sheet surface mass balance” by B. Noël et al.

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This paper by Noel et al. performs a sensitivity analysis of MAR to changes in SIC and SST. As a side, the authors propose a mechanism by which katabatic winds inhibit advection of moisture and heat from the oceans and hence limit the oceanic impact on SMB. The analysis performed here is relevant and important however, the manuscript needs improvement in organization and clarity. I also tend to agree with reviewer #1 that the discussion and conclusions do little to advance the current state of knowledge and that more can be done to increase the impact of this paper.

In addition to the comments below, I suggest that overall improvement of sentence

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structure and organization is needed. Results should simply include the results of the sensitivity tests and the analysis needs to be reorganized into a logical discussion of results. In many cases, the much more detail and discussion is also needed.

I agree with reviewer #1 that the title appears misleading. This is a simple sensitivity test of MAR to SIC and SST. My concern is also that the title uses the word "small" while your abstract, for example simply says "does not affect". Consistency in your conclusion throughout the paper is needed.

P1454L26 "make that" awkward rewrite

P1455L12 "air temperature over and moisture" rewrite

P1455L13-17 Runon sentence, please clean up.

Intro The authors need to make the text more clear wrt the relationship between SMB and events like the 97% melt event. To the reader it is not clear if you are trying to understand the decrease in SMB or the reason for the melt records like 97%. While the two are related they are not the same.

P1456L4 ", and" is typo

Sentence needed describing the negative NAO pattern

P1456L16 Need to explain what "anomalous" means here P1456L16 Warm air advection from where? and as a consequence of what pattern of circulation?

P1459L1 Why is spin up needed in the snow model and why is 5 years the chosen spinup time?

P1459L12 Since this is a sensitivity study, you need to discuss both the scale and pattern of OBSERVED SIC changes in relation to how this method will reduce modeled SIC?

P1460L2 Similar to previous, need discussion to justify your choice of a constant 2,4

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degree changes. How does this compare to the pattern and magnitude of observed and expected future SST changes?

Section 2.3.3 Similar as previous, need more discussion of the relationship between SSTs and SICs. On lines 14-17 you have begun to address questions of this comment as well as the previous two. However this discussion must be more thorough and placed appropriately.

P1461L2-9 This is an important point but could be explained with far better clarity.

P1460L1 We need an explanation of why is this anomaly only occurring in the SE when there are large changes in SIC to the west? This text should be incorporated into an organized discussion section

P1461 Section 3.2 Need to explain the relative contributions of higher near-surface temps and a rain induced albedo feedback to GrIS SMB.

P1462L4-6 This runs on and confusing. Please improve clarity P1462L18 "suggest"

P1462L18 "significant" sounds like it could be referring to statistical significance. Please clarify.

P1462L21 Very passive voice, suggest moving to more active.

P1462L24 Seems to me from figure 2 that the SMB anomalies are in all coastal regions not just west? On that note need text in the results CLEARLY describing the spatial pattern of mass loss on periphery and mass gain on high elevation SE ice sheet.

P1463L9 Seems somewhat contradictory to Figure 2 where precip changes are largest on the steep SE coast. Please clarify. Same for

P1463L11-14. This is out of my expertise but are the katabatic winds not very shallow relative to the depth of the boundary layer over the ocean and thus the depth moist air advection?

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P1463L15 wrt "enhanced in summer", previous discussion mentions how summer SIC has little effect on SMB because the water is almost 0 if SIC is absent. This sentence has to be clarified wrt this point.

P1463L24 Statistically insignificant? P1463L25 "The horizontal temp..."

P1464L15 Seems to me from figure 2 that the SMB anomalies are in all coastal regions not just west?

P1464L22 The combined impact is small but the spatial pattern of SMB change is worthy of more discussion

P1465L15-17 Confused by this conclusion. You just stated that katabatic winds "are strong enough to prevent near-surface oceanic air from penetrating far onto the ice sheet and hence affecting its SMB". Then you state that the melt events are due to "winds advecting warm air to the GrIS, resulting in enhanced surface melting". Given your positioning in the introduction, a more thorough discussion of what could be causing the melt events is needed.

Interactive comment on The Cryosphere Discuss., 8, 1453, 2014.

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