The Cryosphere Discussions

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Interactive comment on "*Brief communication* "Important role of the mid-tropospheric atmospheric circulation in the recent surface melt increase over the Greenland ice sheet"" *by* X. Fettweis et al.

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Review of "Important role of mid-tropospheric atmospheric circulation in the recent surface melt increase over the Greenland ice sheet" By Xavier Fettweis et al.

In this brief communication, the authors present the role of anomalous atmospheric dynamics in the recent warming on the Greenland ice sheet and surroundings. The paper includes sound methodologies and interesting conclusions, and fits well into the scope of The Cryosphere. However, I have two major and several minor issues,

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the latter mostly concerning English language, word order and logical structure. In summary, I recommend publication of this paper in TC after resolving both major issues and a profound revision of the English language and text structure. My comments, as listed below, hopefully assist the authors with that.

Main comments

1. In figure 2, the authors apply a 10 yr running mean on a time series of only 20 yr. First of all, I did not find evidence in the text why this running mean is applied. Moreover, the period of the mean is relatively long compared to the total length of the time series, so the relative weights of the first and last years are high relative to the years in between. In this case, won't this imply that the T700 trend is overestimated?

2. My second main issue concerns Section 6. I think that showing the GCM NAO's is interesting as such, but I would suggest the authors to reflect on the GCM reliability in terms of present-day atmospheric dynamics first. If none of them is able to resolve the NAO variability (including anomalously negative NAO's) in the current climate, what is then the point to show their future behavior? This would involve much more work, and would require, for example, the application of your analogues method and CTC to the GCM output. In general, I would suggest adaptations to the text to reflect this uncertainty.

Minor comments

P4102

L4: towards increasing melt: place this between 'trend' and 'observed'

L8: since 20 yr: since 1992.

L10: mean temperature from reanalyses

L13: in surface = at the surface

L14: put comma after 1990s

L15: islands = Arctic Archipelago

L17: more frequent than before: this is vague, specify

L18: Greenland and the Ellesmere and Baffin Islands

L24: a succession. . ..: move this to between ' observed' and 'over'

P4103

L4: It would strengthen the paper even more if you could update this

L7: which has = and have

L14: elevation change cannot be in or out of balance

L22: comma after modes

P4104

L1: extracting=that extracts

L12: in the last 50 yr = in a longer term

P4105

L4: Reanalysis 1? Specify

L4: NCEP also forms an independent dataset, compared to ERA40/ERA-Interim that are used to drive MAR.

L8-24: This part can be largely improved, first of all by shortening it significantly. Line 17-24 are mostly repetitive statements.

L29: both at the surface and at 500 hPa

P4106

L3: has

L7: the sensitivity of our results to the choice of dataset

L10: I understand, but you used the "non-homogeneous" MAR results to correlate NCEP T700 to MAR melt. Please comment.

L15-17: try to break this sentence in two, that reads better.

L20: I would reverse the statement: the ice sheet top reaches an altitude above that of the 700 mbar pressure plane.

L26: delete 'more'

P4107

L26: in Supplement. Please specify, refer to Table S1.

P4108

L10: less homogeneous? What do you mean?

L16: on average

L17-21: too long sentence and vague statements. It says that Type 1 and 2 both decrease from 15 to 40%? I would also remove the part starting with 'and in particular'

L24: remove 'on the one hand'

L26: on the other hand = Moreover,

L28: at the surface

P4109

L17: is 0.88 with a RMSE . . . and standard deviation of. . .

L19-22: can be removed in my opinion

L20: remove 'successfully'

L23: remove 'still'

L24: and a standard deviation

P4110

L3: remove 'according to' and put Fig.1d between brackets

L15: This step requires some extra lines. Why do you introduce the global mean temperature?

L20-29: I think that also this part does not contain necessary information. Just state that you can explain almost all variability with adding the "anthropogenic" effect plus the atmospheric dynamics. I think this proves that your method works.

P4111

L1: means=implies that

L6:imply=suggest

L6: remove 'forcing'

L7: comma after 'runoff'

P4112

L6: neighbouring Canadian Arctic Archipelago, where . . ..

L7: remove ref to Hanna (2012)

L7: tend to induce a southward flux instead, which explains. . .

L9: remove 'unlike Greenland. . .'

L13-14: Questionable statement, see above

L15: next step will be. . .

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