

Interactive comment on “Evaluation of Greenland near surface air temperature datasets” by J. E. Jack Reeves Eyre and Xubin Zeng

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This paper presents an interesting evaluation of the ability of a lot of reanalyzes, RCM and observations based datasets to represent the current near-surface temperature variability over Greenland. The paper is well written and deserves to be published in TC.

In addition to the Jason Box's suggestions (that I fully support), I have also several recommendations before publication:

- pg1, line 8: The MARv3.5.2 model should be explicitly cited in the abstract.
- pg2, line 9-11: the sensitivity of the MAR results to the reanalysis used as forcing has already been discussed in depth in

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Fettweis, X., Box, J. E., Agosta, C., Amory, C., Kittel, C., and Gallée, H.: Reconstructions of the 1900–2015 Greenland ice sheet surface mass balance using the regional climate MAR model, *The Cryosphere Discuss.*, doi:10.5194/tc-2016-268, in review, 2016.

and in particular for the simulation of the near-surface temperature (see Fig 7 of Fettweis et al., 2016). This works should be cited here and one of the goal of the present work is rather to extent the analysis of Fettweis et al. (2016) because a part of the proposed aim has already been made in Fettweis et al. (2016).

- pg 2, line 19: it is the version 3.5.2 which is used here. Fettweis et al. (2016) must be cited here. Why do not include also MARv3.5.2 forced by ERA-20C in this evaluation ? Outputs are also available on my FTP. In Table 1, change MAR-20CR by MAR-20CRv2c.

- pg 6, lines 14-20. I agree with the authors that Summit is a good candidate to evaluate the near-surface temperature. But, afterward, evaluation is done over all stations. Therefore, I don't see the interest of this small paragraph and of Fig3 which could be put in Supplementary material.

- pg 9, lines 17-25. This paragraph must be reformulated. Firstly, it is true that MAR is worse than reanalyses at the coastal stations but these DMI observations have been assimilated into the reanalysis and not into MAR! Secondly, MAR has been developed for well representing the ice sheet conditions and not the oceanic conditions. Sea ice cover and SST are forced into MAR because their impact on the SMB is low (Noel et al., 2014, TC). When there is sea ice, the sea ice thickness is prescribed to 1m in MAR and MAR computes itself its surface temperature. This explains why the results of MAR at the coastal stations (fully impacted by the neighborhood ocean conditions) are particularly bad in winter because using a fixed sea ice thickness of 1m overestimates the real sea ice thickness in most of the places and therefore allows a extreem cooling of the surface temperature in MAR. In summer, there is less sea ice, coastal near-

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surface temperatures is more impacted by the SST (which is prescribed into MAR) and therefore the MAR results are better (because it is more constrained). This issue with sea ice in winter has been corrected in part in MARv3.6.

- pg 12, lines: 13-14: Done in Fettweis et al. (2016).

- All the datasets should be evaluated also at the summer (JJA) time scale as already suggested by Jason Box. It should be good to have the equivalent of Fig 7 for JJA.

- The mean biases for all CMIP5 model should be listed in Supplementary. What are the best CMIP5 models ?

- In addition to Table 3, mean bias as well as RMSE over 1980-2010 of all data sets used here should be listed for both ice sheet and coastal weather stations.

Interactive comment on The Cryosphere Discuss., doi:10.5194/tc-2016-297, 2017.