**Interactive comment on** “Extreme temperature events on Greenland in observations and the MAR regional climate model” by Amber A. Leeson et al.

Anonymous Referee #1

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General synopsis

This is a generally useful and original analysis of extreme Greenland temperature events that has application to improving current and future Greenland Ice Sheet melt and surface mass balance model estimates (e.g. MAR but also other SMB models). The paper is a bit focused on MAR but there are good reasons for this. The paper is overall reasonably well presented but needs a better attribution of relevant background material in places. It should be of broad interest to Greenland modellers and the Arctic climate community, and should be publishable in THE CRYOSPHERE subject to some relatively minor revisions.

Specific comments

C1

page 1, line 12 (Abstract) “short period variability in time” - please quantify what time range you mean here.


page 2, line 39: after Noel et al., 2016 reference, suggest inert new sentence: “Alternative statistical downscaling techniques fulfill a similar purpose and give broadly comparable results (Wilton et al. 2017, Vernon et al. 2013), and add the following two relevant references. However, RCMs can also make...” : Wilton, D. J. and Jowett, A. and Hanna, E. and Bigg, G. R. and Van Den Broeke, M. R. and Fettweis, X. and Huybrechts, P. (2017) High resolution (1 km) positive degree-day modelling of Green-

p.2, l.45 change to “fidelity at the regional OR SEASONAL scales does not...”.

p.2, l.53: GC-Net also needs Steffen et al. reference here.

p.3, l.69 change ”max” to “maximum”.

p.3, ll.74/75 slightly reword to “The MAR version 3.5 used here has been EXTENSIVELY evaluated in...”.

p.3, l.87 ”MAR-Era data ARE available...”. p.4, ll.97 & 99: “data set” -> “dataset”. p.4, l.101 “below the threshold for three consecutive days” - based on daily mean temperature (and, if so, how is the latter calculated?) or what exactly? Needs a bit more detail/explanation since how this is defined can affect the results.

p.5, l.127: Why is event frequency *positively* correlated with elevaton in North Greenland/the dry snow zone? p.5, l.154: change “∼decadal scale” to “decadal scale”.

p.6, l.158: change “>1.5°C” ro “>=1.5°C” since MAR_Era = 1.5°C.


p.8, l.247 needs punctuation correction to "...given its assimilation of observations; however, we note that...”.

p.9, l.259: "strongly controlled by geography" sounds a bit vague. Can you be more specific, e.g. say topography, elevation and ice/snow facies etc.? p.18/Table 3: add units (e.g. °C/yr?) for "rate of change of mean daily temperature".