

The Cryosphere Discuss., referee comment RC1
<https://doi.org/10.5194/tc-2021-259-RC1>, 2021
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Comment on tc-2021-259

Anonymous Referee #1

Referee comment on "Melt probabilities and surface temperature trends on the Greenland ice sheet using a Gaussian mixture model" by Daniel Clarkson et al., The Cryosphere Discuss., <https://doi.org/10.5194/tc-2021-259-RC1>, 2021

General comments

I think that the authors have done a credible job and that their results are solid. But I also wonder if they have not overcomplicated the analysis. Why not just use the ISTs and IST trends instead of the mixture model? What value added information is provided by the model? I suspect that there is a good reason but it needs to be explained. Please state the reason succinctly in the Abstract, Introduction and Conclusion. Also there seems to be some confusion with the words: pixel, location and points. If I am correct, then they all refer to 'cells' in the gridded dataset. Please be consistent or describe the differences.

Specific comments

Line #

22 Instead of the word 'exceeding,' I would say 'equal to or exceeding'

23 you should reference the paper that describes this dataset instead of the reference shown – see below (Hall et al., 2018)

24 this is incorrect; see below for the corrected citation for Wan and Dozier (1989)

27 GCMs should read GCM

28 please add "under clear-sky conditions" after the word 'measurements'

33 I would delete 'and future events'

38 these are not actually pixels but they are values gridded into cells; therefore, on this line and elsewhere in the manuscript, instead of writing 'pixels' you should write 'cells'

50 daily should read 'near daily'

50 'the dataset' should probably read 'this dataset'

51 please check the time span of the dataset; I believe it ends on 12/31/2020 and not in 2019

54 I would replace the word 'points' with 'cells'

58 delete the words 'a slight'

61 add 'because of cloud cover' after 'summer months'

Fig 1 caption: replace the words 'non melting' with 'available;'; instead of 'locations,' say 'cells'

72 delete single parenthesis

99 please check original reference; this should depend on percent salinity

121 there is also the +/- 1 deg C accuracy to consider

130 is 'sample' the same as 'point,' 'pixel' or cell? If yes, please be consistent and use 'cell.'

134 do you mean greater than or equal to -1 deg C?

Figure 4 in (a) do you mean greater than or equal to -1 deg C? The heading should say 'observed.'

138 since you are referring to the glacier facies/zones, you should cite Benson (1962).

151, 159, 172 & 173 and elsewhere are 'locations' the same as cells? If so, then please use 'cells.'

192-193 is this a statistically significant difference?

203 please delete the word 'etc'

206 the spatial resolution of the product is 0.78 X 0.78 km, not 1 km as stated

206 after the word 'resolution,' please add the following "(cloud-cover permitting)"

Additional or corrected references:

Benson, C.S., 1962: Stratigraphic Studies in the Snow and Firn of the Greenland Ice Sheet, US Army Snow Ice and Permafrost Research Establishment, CRREL Research Report 70.

Hall, D.K., Cullather, R.I., DiGirolamo, N.E., Comiso, J.C., Medley, B.C. and Nowicki, S.M., 2018, A multilayer surface temperature, surface albedo, and water vapor product of Greenland from MODIS, *Remote Sensing*, 10(4):555.

Wan, Z. and J. Dozier, 1989: Land-surface temperature measurement from space:

physical principles and inverse modeling, IEEE Trans. Geosci. Remote Sensing, 27(3):268-278.