

The Cryosphere Discuss., referee comment RC2  
<https://doi.org/10.5194/tc-2021-259-RC2>, 2021  
© Author(s) 2021. This work is distributed under  
the Creative Commons Attribution 4.0 License.



## Comment on tc-2021-259

Anonymous Referee #2

---

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-RC2>, 2021

---

This short paper presents an innovative method to derive melt extent from MODIS surface temperature (ST) based on its statistical distribution. While the presented work seems to be statistically robust, I don't see the interest of this complex method with respect to a simple one based on  $TS > 0^{\circ}\text{C}$ . If TS values larger than  $0^{\circ}\text{C}$  are sometimes retrieved in MODIS, it is due to the presence of rocks or impurities at the surface of the ice sheet ( $ST > 0^{\circ}\text{C}$  can also be seen in the PROMICE AWSs data set). Therefore a comparison with a melt extent independent data set (like a microwave product) is needed to show the interest of this new method. Moreover, to build the statistic model, several years of observations are needed by assuming that the surface conditions remain similar. But what occurs, if rock or impurities appear in surface after a summer with a huge melt? Are the algorithm enough robust to deal with such problem? Idem, what about percolation zone pixels becoming bare ice zone pixels through the recent summers? I suspect that the statistic distribution of these pixels could change... More details about these potential issues are also needed for me.