

The Cryosphere Discuss., referee comment RC3
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Comment on tc-2021-263

Anonymous Referee #3

Referee comment on "Clouds drive differences in future surface melt over the Antarctic ice shelves" by Christoph Kittel et al., The Cryosphere Discuss.,
<https://doi.org/10.5194/tc-2021-263-RC3>, 2021

The authors provide an overview of the driving forces of surface melt over the ice shelves over Antarctica. Although the work is mainly confirming the results of other studies, it is one of the first to provide a quantitative assessment of these driving forces towards the future, which is a step forward in the scientific understanding of how models interact with the surface.

Main comments:

- The paper is well structured & contains a lot of interesting information regarding the representation of melt in future simulations. One aspect that is not discussed however is the effect of precipitation on surface melt. A higher number of clouds would possibly also result in higher precipitation numbers, which would increase the surface albedo. This counteracts part of the warming induced by the increase in liquid clouds and LWD. It would be nice to see the contribution of precipitation and surface albedo in the results.

- The paper mainly discusses averages changes towards the future. However, most of the large melting occurs during 'events' nowadays. With the increase in general surface temperatures towards the future, I am wondering if these individual melt events become of lesser / higher importance & that individual events will still be the driver of most melt or that temperatures will increase to such a level that melt will occur during the whole summer.

The paper is clear and well written, i only have a few specific comments: :

- When first reading the title of the paper, I immediately thought of the paper of Van Tricht (<https://doi.org/10.1038/ncomms10266>). Despite dealing about a similar subject (although another ice sheet), I think a reference to this work is valid somewhere in the introduction. A same set of techniques is also used in the methodology & results section and in the discussion, one could relate to the differences between the Greenland & Antarctic Ice Sheet

- Specify on line 134 that NorEsm is the lowest range model & CNRM is the upper range (instead of line 140)