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The Cryosphere Discussions

Interactive comment on "Modelling the fate of surface melt on the Larsen C Ice Shelf" *by* Sammie Buzzard et al.

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We would like to thank both reviewers for their thorough and detailed comments which have helped to greatly improve this manuscript. We have not noted here changes to capitalization, grammar, minor wording etc. as these we generally agreed with and implemented, but we have listed any changes to content. Page numbers here correspond to original pdf.

Rev 1:

Detailed changes to specific comments:

Pg 1 line 19- Reference added

Pg 2 line 1- Yes it would be clearer to point out that it's the most northern undisturbed ice shelf given there are e.g. remnants of Larsen B, we have changed this.

Pg 2 line 3- it is unclear why this should be removed

Pg 2 line 7- we agree with this additional text

Pg 3 line 20- text added but moved to new section 'Modelling current melt lake formation on the Larsen C Ice Shelf'

Pg 4 line 1- text added to say this includes a spin up period

Pg4 Fig 2- the surface is plotted here in relation to the surface at t=0, this is now clarified in the figure caption

Pg 6 line 7- as the size of the catchment area is fixed it is not altered by weather events but since the catchment area firn needs to be at zero degrees for meltwater to travel rather than refreeze the overall level of meltwater added to the lake will be.

Pg 6 line 8- this is Allen's calculation, we thank him for this in the acknowledgements (and he is happy with NSIDC as his affiliation here).

Pg 11 line 8- This is not accounted for by the model but is a good suggestion for future improvements that we will bear in mind.

Pg 14 top of page- This is now covered in the methods section, snow is added from reanalysis data as it was not available from the AWS but I had accidentally failed to include this.

Pg 14 line 5- The wintertime foehn winds are not included here as the Kuipers-Munnekke et al. study investigating these was published after this work was submitted. However, after having spoken to one of the co-authors of this study we feel that this may be an area worthy of further investigation in future work once more data becomes available as their study concentrates on what may be an extreme year.

Rev 2:

The comments on the structure of the paper have been taken on board and the paper restructured to make a clearer 'methods' section which we agree is beneficial to the clarity of the paper. Within the methods section the location of the AWS data used is clarified (no publicly available data was available at the time the work was completed so although we agree that it would be useful to use multiple weather stations this was not possible- this is something we hope to be able to do in the future as more data becomes available).

Pg 1 line 24- References updated following suggestions

Pg2 figure 1- Citation for MODIS imagery added

Pg 2 line 8- Reference corrected

Pg 3 line 13- More detail added to the following paragraph to explain the ice lens in 1D

Pg 3 line 25- more detail added

Pg 3 line 28&30- reworded to correctly attribute the data

Pg 4 line 3- clarification added

Pg 4 line 5- additional information in the new methods section should explain this

Pg 4 Fig 2- Text added to the figure caption, the comment about modelling a specific area has now been incorporated into the first paragraph of the new section 'Modelling current melt lake formation on the Larsen C Ice Shelf'.

Pg 5 Fig 3- the lower density is from snowfall added, this has been added to the figure caption for clarification and the addition of snow added to the methods section.

Pg 5 line9- This is true but we are specifically trying to model lake basins/ areas of high melt rather than the whole ice shelf.

Pg 6 line 3- Data correctly referenced now

Pg 6 line 5- added to methods section

Pg 6 line 6- reworded to clarify

Pg 6 fig 4- units added, this figure doesn't correspond to fig 1, that was just a good example of clear MODIS imagery that shows the lakes well.

Pg 7 line 3- agreed, we think this move makes the structure much easier to understand for the reader

Pg 7 line 14- reference for this added

Pg 8 Table- having experimented with this we felt it made the table less easily readable- the value is in the table caption

Pg 8 line 6- First paragraph of this section moved to methods

Pg 9 line 13- We feel that in this case, as this simulation was carried out as a result of seeing the outcome of previous simulations this may be more confusing to put in the methods section.

Pg 11 and Pg 14 These are now both discussed immediately before the conclusions.

Please also note the supplement to this comment:
https://www.the-cryosphere-discuss.net/tc-2018-84/tc-2018-84-AC1-supplement.pdf

Interactive comment on The Cryosphere Discuss., https://doi.org/10.5194/tc-2018-84, 2018.