

Interactive comment on “A mechanism that produces dichotomy in melt pond coverage in sea ice floes” by Predrag Popović and Dorian S. Abbot

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Review posted by editor on behalf of anonymous reviewer

Much improved.

L 240- 250 the statements suggesting that hypsographic curves are general across sea ice in line 240-250 should be removed. It is likely that hypsographic curve of sea ice varies greatly due to many influences on topography. Related discussion could suggest that this model would be made stronger by input of accurate curves.

490 - vertical sidewall melting appears to be unimportant, the freeboard mechanism dominates. That is the conclusion here. This additional sentence trying to justify vertical sidewall melting is unsupported. By itself this sentence would be innocent, but

C1

the first part of the discussion (5.1) which seems to be trying to focus on mechanisms of accelerated melt around pond edges really works this topic more. The extended discussion of vertical melt around pond edges doesn't really seem to have any place here given the behavior of the model. Suggest removing entirely. If not... see below.

Section 5.1 is problematic. It struck the reviewer as disingenuous to discuss all these mechanisms and then admit at the end that the available evidence suggests none are important, only as an aside. The model suggests changes in freeboard, and though the authors gloss over it, changes in hypsographic curve are the important features. The discussion should focus on these rather than relict bits from prior version. An analysis of sensitivity to ice topography/roughness/hypsographic curve would be very highly valuable to the community here instead. There are also issues with the summary of the literature and applicability for several of the topics written as well.

line 545 - thin layer of water... due to multiple light reflections. I think you mean refractions and you should clarify that the refraction occurs more strongly (and hence more backscatter occurs) when the ice is not covered by liquid and air occupies pore/intercrystalline space.

paragraph around line 550. Yes, this generally describes grain ripening, but this process is not significant for large scale 'jagged' features and 'smoothing' ice. It is a microstructural process, and one unlikely to be much more prevalent near ponds than away from them, therefore not a good candidate as described.

c- 557 - needs a reference, or replace 'often' with something softer like 'sometimes' and a personal communication.

580 - the ridge accelerated melt is largely fictitious. For every sun-ward side, there is a shaded side.

-SHEBA ponds are not first year ice, nor were they all permeable during the times the authors use for comparison. This creates several instances in needed of adjustment or

C2

revision.

-The conclusion of 1.3 percent per month in a warming climate is way to shaky to be allowed in the abstract or conclusion as a strong take home point. There are numerous processes not accounted for here. Trumpeting a pond coverage trend in a warming climate based only on an idealized model of one of several pond formation processes is just too bold to pass peer review. The strong conclusions of this paper are with regard to the relative roles of various processes implied. This point may be presented only in the discussion as a possible outcome given particular assumptions, not as a main take home of the paper.

Interactive comment on The Cryosphere Discuss., doi:10.5194/tc-2016-7, 2016.