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The Cryosphere Discussions

Interactive comment on "Distribution and seasonal evolution of supraglacial lakes on Shackleton Ice Shelf, East Antarctica" *by* Jennifer F. Arthur et al.

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Arthur et al. present a data set of long-term (2000-2020) remote sensing observations of lake extent, depth and volume on Shackleton ice shelf East Antarctica. They find that lakes predominantly form and exist in the ice shelf grounding zone, and that lake extent displays substantial seasonal and interannual variations. They do not find a clear connection between summer temperature or melt and lake extent, which suggests that lake formation is likely associated to episodic strong melt events. This is a well-written paper, and the methods and results (including uncertainties and limitations) are presented in a clear and coherent way. I think it is suitable for publication in

The Cryosphere after some revisions, mainly clarifications and some extension of the discussion. I have highlighted some ideas below.

L67: the ice shelf itself. . . Perhaps rewrite to: 'the ice shelf surface flow has accelerated' or 'speed has increased'. . .

L170: we found a mean absolute error of 0.007 and a root mean square error of 0.029 between manually-digitised SGL areas and those derived from NDWI What are the units?

L178: just out of curiosity, would you expect variability in lake bottom albedo based on its proximity to rock outcrops, due to eolian deposition of dark material on the surface that is then collected in the lake?

L206: 0.25 degree in a regular grid translates to a much higher longitudinal resolution at high latitudes.

L213: The routing analysis is useful, but is highly simplified since it does not allow for flow in the firn and subsequent storage. This should be clearly indicated here, and/or in the discussion.

L251: likely because of its northerly location, allowing an earlier start of the melt season?

L275: in principle, lakes could also drain vertically via fractures. This is discussed later, but not mentioned here.

L407: The authors briefly discuss the poor correlation between lake extent and temperature and melt. I would agree that these results are not surprising, given the fact that ERA5 nor RACMO2 (at this resolution) cannot resolve the atmospheric phenomena around the grounding zone (katabatic winds, enhanced turbulent mixing around slope break from grounded to floating ice), and -at least as important- do not account for the presence of blue ice or outcrops and their low surface albedo. So, while lake formation might be more associated to episodic melt events – as the authors suggest, since the

datasets used here do not even represent the climatology and spatial heterogeneity correctly, it is hard to proof either way. Perhaps it's worthwhile to extend this discussion somewhat.

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