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Interactive comment on “Predicting subglacial lakes and meltwater drainage pathways beneath the Antarctic and Greenland ice sheets” by S. J. Livingstone et al.

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This addition provides an updated set of predictions and commentary on the subglacial hydrology of the Greenland Ice Sheet (Fig. 1; previous Fig. 5a), using the latest bed elevation dataset provided by Bamber et al. (2013).

The better resolved (more flight lines) and higher resolution (1 km rather than 5 km) bed elevation dataset (Bamber et al., 2013) results in many more subglacial lake predictions compared to the old 5 km dataset (9,158 subglacial lakes compared to just 91 previously) (Fig. 2; previous Fig. 4), and the simulated subglacial lakes cover a greater fraction of the bed (1.9% rather than 0.2%). Indeed, the distribution of simu-

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lated subglacial lake areas now displays a striking similarity to the Antarctic Ice Sheet (Fig. 4), although very large lakes are still not produced. Despite this large increase in the frequency of, predominantly small subglacial lakes, the gross distribution outlined in our current manuscript is comparable (Fig. 1). Crucially, these results support our previous assertion that although subglacial lakes are likely to exist under the Greenland Ice Sheet, they are less common than beneath the Antarctic Ice Sheet (4% of the bed).

Although the gross drainage patterns are similar to those calculated using the previous bed elevation dataset, there are subtle differences in flow direction and network organisation (e.g. the downstream end of the North East Greenland Ice Stream).

Subject to the reviewers comments we propose to update the subglacial hydrological predictions with the latest bed-elevation dataset in Greenland (Fig. 1, Bamber et al. 2013). This would bring the paper up-to-date with the latest available dataset and allow a more accurate comparison with the Antarctic Ice Sheet (as the BEDMAP2 bed elevation data is also gridded at 1 km). Moreover, this has implications for the modelling results from Last Glacial Maximum to present day, and we therefore intend to update these results, and figures, accordingly.

Reference: Bamber, J.L., Griggs, J.A., Hurkmans, R.T.W.L., Dowdeswell, J.A., Gogineni, S.P., Howat, I., Mouginot, J., Paden, J., Palmer, S., Rignot, E., Steinhage, D. 2013. A new bed elevation dataset for Greenland. *The Cryosphere* 7: 499-510.

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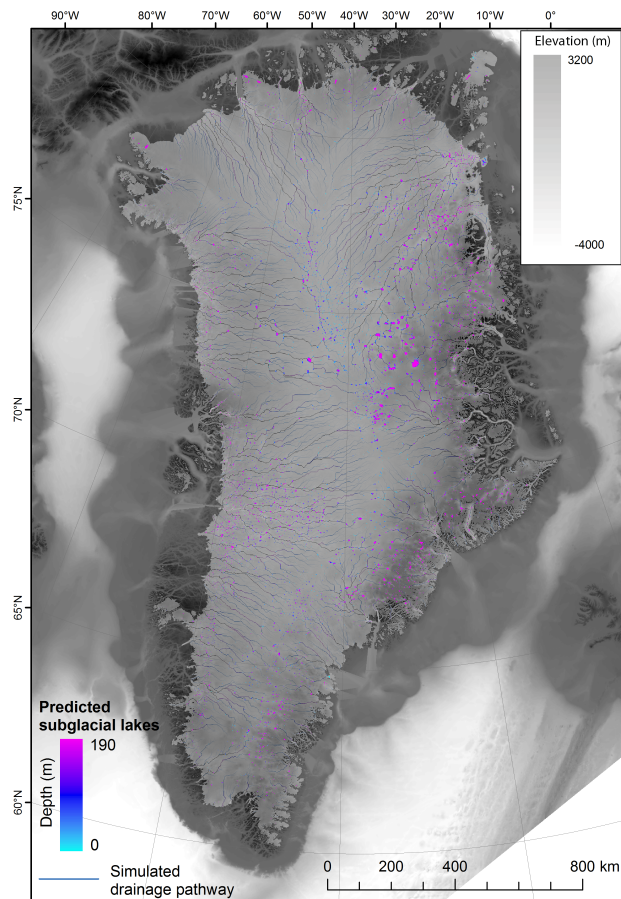


Fig. 1.

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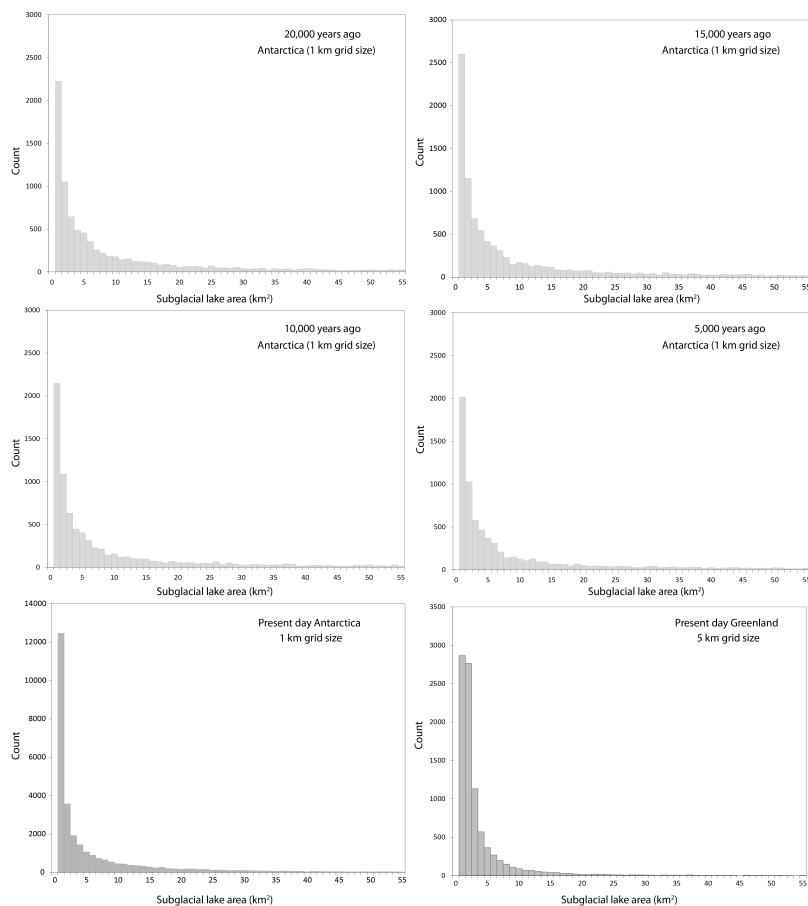
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Fig. 2.

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