The Cryosphere Discuss.,
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The Cryosphere Discussions

Interactive comment on "Contribution of calving to frontal ablation quantified from seismic and hydroacoustic observations calibrated with lidar volume measurements" *by* Andreas Köhler et al.

Anonymous Referee #2

Received and published: 21 August 2019

Review: Kohler et al., 2019 TCD

Dear colleagues,

The manuscript "Contribution of calving to frontal ablation quantified from seismic and hydroacoustic observations calibrated with lidar volume measurements" by Kohler et al. presents nice and interesting results. It investigates frontal ablation based on comprehensive field dataset and suggests a possible large contribution of submarine melting to frontal ablation. This is a timely topic in the community and relevant for the journal. The manuscript is well written and easy to understand. After some enhancements of results and discussion, I recommend publication.

Sincerely,

General comments 1. I understand that the accurate estimation of iceberg volume from lidar is one of the foundations of the study. Therefore, I think you need to present a figure showing DSMs differences in the article. Perhaps, you could show such plot above Figure 2? Also, I wonder what the uncertainty range of the calculated iceberg volume from the lidar datasets is.

2. I am curious to see the cumulative distribution function of modeled iceberg volumes, which you could investigate the completeness of iceberg volume from their distribution. Perhaps, you could show such plots beside Figure 4?

Specific comments Page 1: author name: remove space between the author names and superscripts numbers.

Page 1, line 9: 18-30% -> use en-dash instead of hyphen. I found the same typo many times later in the manuscript. You need to correct them accordingly.

Page 2, line 14: Yahtse glacier -> Yahtse "G"lacier

Page 2, Study site: It would be worth to introduce a bit more info about the glacier for readers who are not familiar with the glacier. For instance, how fast the glacier? How wide the ice front? How deep the fjord near the ice front? How warm or cold the fjord? I believe that this information would be useful later to think of the relevance of the method to apply to other regions.

Page 3, line 10: use minus but hyphen: -166 $\pm$ 1

Page 3, line 27: Only a few percent. . . -> I prefer to know an explicit number. Also how big was submarine calving iceberg at the glacier? Could be much bigger than subaerial calving?

Page 4, Repeat lidar scanning: I'm not familiar with lidar scanning but does lidar signal penetrate ice? What is the uncertainty of the calculated iceberg volumes, after all?

Page 6, Figure 2: I want to see a plot of DSMs differentiation of the corresponding calving event presented in Figure 2. Is it possible to show such plot above Figure 2?

Page 7, line 9: Were calving events uniformly distributed along the ice front? Did you find any spatial distribution of the located calving events?

Page 8, line 8–9: How did you find real-world coordinates of calving events from time-lapse images?

Page 9, Equation 2: Would be better to make the outermost parentheses lager for better readability.

Page 10, line 27: I'm curious to see CDF of the modeled iceberg volume so that we can learn which size of calving is missing.

Page 13, line 28: insert space before and after +/- sign.

Page 15, line 5: It the inferred submarine melt rate is consistent with the recently reported submarine melt rate at the glacier (Schild et al., 2018; Holmes et al., 2019)?

Page 15, line 10–11: Did you confirm the spectral difference between submarine and subaerial calving on hydroacoustic signals at the glacier?

Page 16, line 5: "South America" -> "Patagonia" makes more sense to me.

Page 16, line 24: Apart from the novelty to use hydroacoustic signals, did you find any advantage to use hydroacoustic signals with seismic signals? Perhaps, you may have a chance to include submarine calving to the model by using hydroacoustic signal somehow?

Figure A1. How did you convert pixels into the real-world coordinate?

Figure B1. I am somewhat unhappy with the units of the plot. Consider using meter or kilometer instead of latitude.

References Holmes, F. A., Kirchner, N., Kuttenkeuler, J., Krützfeldt, J., & Noormets,

R. (2019). Relating ocean temperatures to frontal ablation rates at Svalbard tidewater glaciers: Insights from glacier proximal datasets. Scientific Reports, 9(1), 1–11. https://doi.org/10.1038/s41598-019-45077-3

Schild, K. M., Renshaw, C. E., Benn, D. I., Luckman, A., Hawley, R. L., How, P., ... Hulton, N. R. J. (2018). Glacier Calving Rates Due to Subglacial Discharge, Fjord Circulation, and Free Convection. Journal of Geophysical Research: Earth Surface, 123(9), 2189–2204. https://doi.org/10.1029/2017JF004520

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