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Discussions

Interactive comment on "Using ICESat-2 and Operation IceBridge altimetry for supraglacial lake depth retrievals" *by* Zachary Fair et al.

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This paper provides straightforward information about a very interesting proof-of-concept application of ICESat-2 to studying supraglacial lake depth, which I am sure will be the basis of much future work and investigation. Thank you for this work, which I'm sure will push the work of our research community forwards! It is well written, generally easy to follow, and provides robust conclusions it its scope. In this review I have only a few comments and questions that I hope will bring even more clarity and ability for further applications - some on style & methods, some on date & code citation/sharing, and some about the particular scope that this paper has chosen.

Scope: *The paper limits itself to central strong beam (GT2R), but then also includes

lower confidence photos from this band which "decreases measurement precision but gives better agreement with ground-based data." Because of this, I am wondering why other beams were not used, or at least their potential use discussed in the paper? *Page 6 Line 14: Do you have any estimate for just how widely applicable these methods will be / how easy it is to get good coverage? I understand you have to put limits on this paper somewhere, for sure, so this is mostly out of curiosity and might be of interest in a discussion/conclusion?

Data & Code Citation/Sharing: **The Cryosphere's data policy states that "Authors are required to provide a statement on how their underlying research data can be accessed. This must be placed as the section "Data availability" at the end of the manuscript." I did not see such a section. Clarity in citing the exact subsets of the large datasets that you cite would be ideal (which I know is also in your Table 1, but not presented in one place).

**The Cryosphere guidelines also state that "Data do not comprise the only information which is important in the context of reproducibility. Therefore, Copernicus Publications encourages authors to also deposit software, algorithms, model code, video supplements, video abstracts, International Geo Sample Numbers, and other underlying material on suitable FAIR-aligned repositories/archives whenever possible. These materials should be referenced in the article and cited via a persistent identifier such as a DOI." There is clearly a lot of important code developed and used by the authors, and it would be in line with this journal's goals that it be documented, shared, and cited. This would allow for reproducibility, further application of these methods, and further refinement, as well. I very much hope that the reviewers document, share, and cite the final version of their code to make their methods as open as the data they use and the publication they have chosen to publish in. (Of course, if you have another code/methods paper in prep, then please do cite that and I apologize for jumping the gun!)

*And since I'm talking about data and code sharing - at the risk of inviting my own

citation - you cited Pope at al 2016 on Page 2 Line 23/24. I wonder whether you might (also) want to cite Pope (2016), which I bring up here because if more fully describes, documents, and shares the code developed and used in the Pope et al paper. https://doi.org/10.1002/2015EA000125

Other Manuscript Comments: *Page 1 Line 8-9 (Abstract): Can you quickly mention where the uncertainties are derived from here? It might just be me, but if quickly reading, it makes it sounds like there is comparison to some in situ data...

*Page 4 Line 10: about how long is each data granule, in ground distance, to include 10^4 - 10^5 photos per window? I think this will help people understand the next assumptions.

*Page 4 line 14: How were these ranges selected / chosen? This would seems to be an important part of method development.

*Page 4 Line 14: I'm sorry if I missed it, but can you define sigma in the text upon first usage?

*Page 4 Line 17: Consider replacing "lake surface" with "height of the lake surface" and underlining the letters h, s, f, and, c in order to make the abbreviation very clear?

*Page 4 Line 20: How were these ranges selected / chosen? This would seems to be an important part of method development.

*Page 4 Line 22: Consider replacing "lake surface" with "height of the lake bottom" and underlining the letters h, b, t, and, m in order to make the abbreviation very clear?

*Page 4 Line 27: How were these filters chosen? This would seems to be an important part of method development.

*Page 4 / Section 3.1 in general: It would be even clearer to present these methods if there were agreement between the steps here and in Figure 2 (e.g. one box / arrow per bullet point).

*Page 6 Line 18: I could be wrong, but it is possible that Figure 1 and 2 are cited in backwards order? You might consider flipping their numbers?

*Page 5 Line 27: You mention a refraction correction but then there is no further detail. I know it is pretty basic, but for full clarity perhaps describe slightly more / provide a citation for the method you use for refraction correction?

*Page 6 Line 29: I wonder if you this it is important to re-emphasize the filtering of which lake depths were kept in presenting average lake depths? e.g. lots of shallow lakes aren't being included?

*Figure 1: Consider using dots to indicate location, rather than ovals, which are much larger than the image are?

*Figure 2: It is slightly confusing that you use the same blue boxes for both data and processes (e.g. Landsat 8 imagery vs verify lake detection), consider using different shapes / colors / some design choice to indicate the difference?

*Table 2: Please also define d_s, d_p, and L in the table caption.

Interactive comment on The Cryosphere Discuss., https://doi.org/10.5194/tc-2020-136, 2020.