

The Cryosphere Discuss., referee comment RC2
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Comment on tc-2022-7

Anonymous Referee #2

Referee comment on "Comparison of in-situ snow depth measurements and impacts on validation of unpiloted aerial system lidar over a mixed-use temperate forest landscape" by Holly Proulx et al., The Cryosphere Discuss., <https://doi.org/10.5194/tc-2022-7-RC2>, 2022

Proulx et al. 2021 provide an interesting analysis of the impacts of manual snow depth probing techniques and the implications of that in UAS-lidar snow depth validation. Overall this manuscript is well written and clear in its intentions and execution and was an easy read and I commend the authors on that aspect. Overall I struggle with whether the results have the significance to merit the level of a research article ("substantial and original scientific results") level versus a brief communication (or what I would like to call a technical note but is not an option in TC). The findings do have implications on further work in the area but are not by themselves novel (ie a main conclusion of magnaprobe oversampling versus a snow tube is references as a finding of Berezovskaya and Kane (2007) while the authors and others have already published on uas-lidar snow depth validation and accuracy assessment at this site). In terms of content I have a number of minor comments and so would recommend minor revisions prior to publication pending the editor's assessment of whether this merits a research article or should rather be a brief communication. The contents definitely fit the scope of The Cryosphere so regardless would like to see the work published herein.

Main comments:

- Pending a determination of whether or not this should be considered a standalone research article or brief communication will determine whether this scope should be significantly narrowed or not.
- A bias in instrument type is evident and in this shallow snow is on the order of 12% of depth. With respect to the uncertainties evident in manual sampling and moreover in the uas-lidar product is this a relevant difference in the context of all the other uncertainties involved? I'd like to see a more direct and clear assessment of this. In

deeper snow for example 1-3cm error is negligible...

- There is an assessment of the penetrability of the magna versus tube in leaf litter in a snow free situation. Is this relatable to the snow-covered situation. Is compaction of leaf litter and/or snow/ice within the litter may change the penetrability of the litter versus when it is uncovered in the warm season? Any insights on this?
- Is magnaprobe weight in bare scenario the same as the pressure exerted when pushed through the snow? Was there ice layering present in the snow situations that would influence the penetrability and force necessary for the probes? Were both probes pushed straight in or was the tube rotated to cut? An important distinction perhaps.
- I don't see any clear hypothesis for why the difference between magnaprobe and snow tube? What comes to mind for me is that the tube has a wide/large surface area of orifice that will distribute pressure so won't penetrate substrate as easily? From a scientific process perspective a hypothesis like this may streamline the content...
- What about rebound of the litter/veg in bare situations? Section 4.5 in Harder et al., 2020 discusses some of the challenges associated with snow depth obs over vegetation (ie compression of vegetation by overlying snow can lead to underestimated snow depths). An additional challenge for uas-lidar is that vegetation can displace the base of a shallow snowpack from the reference soil surface introducing a bias of actual snow depth that uas-lidar and probing will both miss for example. Any of those sorts of challenges encountered? Perhaps a picture of the surfaces/leaf litter would be helpful to provide context.

Technical comments:

291-292- what were the absolute differences? Not as relevant a distinction if they were in very shallow snow for example.

381 impale - > penetrate?? The imagery of impaling leaf litter or any hapless subnival creature living there is vivid but perhaps penetrate is better/less exciting?