

Dear Dr. Bair,

thank you for the positive feedback and useful comments which will improve the manuscript. Below, your comments are in blue, our point-by-point responses are given in black.

1. The authors note that in some cases the "snowpack tended to arrest cracks without slab fractures" but no information is provided about how the absence of slab fracture was measured.

Thanks for pointing this out, in the revised manuscript we will mention that we did not observe strain concentrations in the slab that are typically associated with slab fractures.

2. The choice of column length in all the experiments (Table 1) is not justified. I presume other tests were done before the authors decided to excavate a 9 m long PST?

The choice of column length was mainly restricted by logistical constraints. The width of the roof (our field site) was 10 meters, while the length was 30 meters. To film such long PST experiments, the distance between the camera and the side wall of the PST has to be at least 12 meters. As initially we did not want to remove a large part of the snow, for the first few experiments, we used shorter columns. Once we had removed enough snow to allow full width experiments, we always performed 9 m long PST's.

The abstract says that tests up to 10 m long were performed, but the longest column length in Table 1 is 9 m. Please explain.

This is an error. The width of the roof was 10 m but the tests were somewhat shorter. We will correct this in the revised version

3. Edge effects from the near and far end of the PSTs are discussed, but the edge effect of the width of the PST is only briefly mentioned (as an experimental error on Feb 22 2019). I assume the width of most of the PSTs was 30 cm? This needs to be stated.

We will state the PST column width of 30 cm in the revised manuscript.

4. There are at least 2 studies, e.g., Bobillier (2022) and Trottet et al. (2022), that are not publicly available, as they are in review and in press, respectively. By Copernicus (standards https://publications.copernicus.org/for_authors/manuscript_preparation.html), these articles can only be cited if they are available to reviewers, and must be publicly available at the time of final submission.

The study by Trottet et al. (2022) is now published and available under the following DOI: <https://doi.org/10.1038/s41567-022-01662-4>

The study from Bobillier et al. (2022) is still under review. I sent you the current version by e-mail on 5 Nov 2022.

Below we comment on the annotated PDF (line numbers refer to your supplemented PDF):

LINE 37: Of 10 crowns carefully examined in situ or photographically, almost all were thinner at the flanks, suggesting that arrest has a strong dependence on slab thickness. See Bair et al (2010).

Bair, E. H., K. W. Birkeland, and J. Dozier (2010), In situ and photographic measurements of avalanche crown transects, *Cold Regions Science and Technology*, 64(3), 174-181, doi: 10.1016/j.coldregions.2010.08.004.

Thanks for pointing out these studies- We agree that slab thickness can influence crack propagation. Here we wanted to point out that crack arrest can occur if snowpack changes are gradual and even if no clear snowpack changes are observed.

LINE 98: Any other important characteristics about this site that made it an ideal outdoor laboratory? Does it get direct sunlight that time of year? Any wind? Is the building heated? Is the roof concrete?

We will describe the site in more detail in the revised manuscript. The site is surrounded by trees which protect it from wind. The nearby creek, together with the cold concrete roof (snow-concrete interface usually colder than $-5\text{ }^{\circ}\text{C}$) promote the growth of surface hoar, and direct sunlight does not reach the field site until the end of February. These factors make the site an ideal outdoor laboratory for large crack propagation experiments under controlled snowpack conditions.

LINE 100: Is that the layer thickness or the crystal size, or both?

It is both. We clarify this in the revised manuscript.

FIGURE 1: That's a thick red area. Did the surface hoar layer develop over multiple days?

Indeed, the surface hoar developed during the period indicated by the red area. It was a period of cold, clear weather without precipitation and wind. We will mention this in the revised manuscript.

LINE 131: Can you expand on this? If tracking a saw with a black dot against a white background automatically is unreliable, then how can the DIC tracking be reliable for the snow?

Tracking the black dot mounted on the saw was unreliable as the algorithm sometimes did not find the dot in the image. This was caused by light reflections, as the dot was printed on paper and laminated in plastic, strongly reflecting light. For the manual snow saw tracking, this was not an issue.

LINE 141: exp is experimental?

Yes, we will clarify this in the revised manuscript.

LINE 142: subscripts needed

Thank you for catching this error.

LINE 183: How was the area free from edge effects defined? It appears as the acceleration/deceleration is below some unstated threshold.

That is correct, for mean speed computation, we choose the propagation range where the crack speed showed less acceleration/deceleration. We did not use a fixed threshold value, but selected this range subjectively by hand.

LINE 269: Maybe put a reference to this section earlier, when the manual section is introduced without any further justification. Also there are still edge effects from the limited width of the beam that should be acknowledged.

This is related to question 3 above. As long as the column width does not change (in horizontal and vertical direction) we are not aware of effects affecting our measures.

TABLE 1: How was the column length selected? Were other tests done first?

Please refer to our reply on your question 2 above.

LINE 297: That statement could be generalized to most of the results. PSTs on flat terrain are dominated by vertical displacement.

True, as we stated in line 295, flat field PSTs are always dominated by vertical displacements. At this point, we deem it worth to stay very specific to discuss the implications (e.g. measuring a flexural elastic modulus rather than a Young's modulus)

LINE 417: what ? authors? studies?

We will clarify this in the revised manuscript.

LINE 486: These 2 studies are in review and in press respectively, and neither are available publicly. Please fix and make sure they are publicly available for final submission

Please see our reply to your question 4 above.

TABLE A2: This table is unnecessary and could be summarized in a sentence or two.

To reproduce the results, this table is necessary. We do not see how all values can be mentioned in two sentences. We agree that most readers will not need this information, which is the very reason we have placed it in the Appendix.