

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC1
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Comment on nhess-2022-161

Anonymous Referee #1

Referee comment on "Temporal evolution of crack propagation characteristics in a weak snowpack layer: conditions of crack arrest and sustained propagation" by Bastian Bergfeld et al., Nat. Hazards Earth Syst. Sci. Discuss.,
<https://doi.org/10.5194/nhess-2022-161-RC1>, 2022

Review of nhess-2022-161

Summary and general comments

The paper "Temporal evolution of crack propagation characteristics in a weak snowpack layer: conditions of crack arrest and sustained propagation" deals with the dynamic crack propagation within weak snowpack layers. The dynamic crack propagation occurs within the release process of dry-snow slab avalanches and is therefore of interest for the (scientific) avalanche community. The authors performed 24 propagation saw tests (PSTs) over a period of three months, recorded those tests with a high-speed video camera, and manually measured snowpack properties. The camera data was analysed with digital image correlation techniques. From the PST experiments the authors derived the elastic moduli of the slab and the weak layer and the specific fracture energy of the weak layer with a homogeneous and a layered slab model. Moreover, they measured crack speed, touchdown distance, crack length, and energy dissipation.

The data presented within the paper is certainly new and of value to the scientific community. The writing of the paper sometimes seems unnecessarily complicated to me. For readers familiar with the topic, the paper should be good to read. I suggest performing the modifications to the paper listed below. All in all, I feel that the paper is a valuable contribution to the scientific community.

Specific comments

First sentence of abstract: This sentence might seem a bit confusing and complicated for readers not familiar with slab avalanche release. I suggest making it simple: "For a slab avalanche to release, we need crack propagation in a weak snow layer beneath a cohesive snow slab." Then continue describing crack propagation, etc.

Abstract again: a PST is not common knowledge, I would think. Maybe write "we performed crack propagation experiments... ". You can then describe the PST in more detail in the intro and/or methods section.

Figure 2: What about the crack speed curves for the other experiments? It would be interesting to see the others as well. Are they very similar or completely different? If there are differences, how can those differences be explained?

Line 225: How valid is the assumption that the slab and substratum are in the same stress state before and after crack propagation? Will there be no plastic deformation within the slab due to the collapse?

Line 275: Here you say that the slab was shallow and soft and it broke while cutting the weak layer. How does this fit with the assumption in line 225?

Discussion: In general, the first sentence of a paragraph should summarize the paragraph and tell the reader what the paragraph is about. I have the impression that this "first-sentence-summary" concept was not used in the discussion, which makes it a bit tedious to read. I suggest adding "first-sentence-summaries" at the beginning of the paragraphs.

Technical corrections

Line 52 and at many further places throughout the document: Variable identifiers (in your case the f and the dyn) are not italicized.

[https://blog.apastyle.org/apastyle/2011/08/the-grammar-of-mathematics-writing-about-variables.html#:~:text=Identifiers%20\(which%20can%20be%20superscript,boys%E2%80](https://blog.apastyle.org/apastyle/2011/08/the-grammar-of-mathematics-writing-about-variables.html#:~:text=Identifiers%20(which%20can%20be%20superscript,boys%E2%80)

%9D)%20are%20not%20italicized.

Line 78: omit the "initial"

Lines 84-85: firstly and secondly (adverbs referring to the verb "is")

Figure 1b: using a second y-axis (on the right) for the temperature would be more elegant.