The Cryosphere
Discussions

Open Access

EGU

Interactive comment on "Validating modeled critical crack length for crack propagation in the snow cover model SNOWPACK" *by* Bettina Richter et al.

Anonymous Referee #2

Received and published: 31 July 2019

In this study, the authors seek to 1) investigate the performance and limitations of SNOWPACK for predicting the critical crack length using the previously suggested parameterization for the critical crack length from Gaume et al. 2017 and 2) potentially improve this performance with the introduction of a further-developed parameterization of the critical crack length.

With their improved parameterization, the authors demonstrate a significant enhancement of the performance of SNOWPACK in its ability to automatically detect the formation of weak layers in the snowpack. This is demonstrated through the thorough evaluation of the improved parameterization when compared to field-collected snowpit

data that was taken over 3 winter periods, at two locations, and with 145 propagation saw test experiments on known weak layers.

This work is thought to be of relevance to both the scientific research community as well as the operational avalanche forecasting community, and the authors are congratulated on their efforts.

After careful review, I have found that the article "Validating modeled critical crack length for crack propagation in the snow cover model SNOWPACK", submitted to the The Cryosphere by Bettina Richter et al., is well-written, provides adequate evidence in support of their conclusions, and is in general suitable for publication with only minor revisions.

Recommendation: Publication with minor revisions

Detailed line item suggestions below:

Page 4, line 6: please briefly explain Neumann boundary conditions and why this was chosen for the snow surface.

Page 4, line 7: add citation for the chosen geothermal heat flux of 0.06 Wm-2.

Page 4, line 22: the density of the weak layer (rho_wl) does not yet appear to have been defined before being used inline in the text.

Page 5, figure 1: In this figure, please make clear in the text and caption where the a and b values came from or how they were derived.

Page 6, line 1-2: Can you comment or add a citation for how accurate these parameterizations are? Such that if it were possible to measure the weak layer shear strength and/or the elastic modulus of the slab in the field, should this be done? Or are these parameterizations thought to be adequate?

Page 6, line 16: why was a range of 5cm chosen?

Page 6, line 17: Curious, were there ever weak layers identified in the field that could not be tested with a PST test? (e.g. was the weak layer ever too thin or too difficult to follow with a saw blade?) Also, what are your general thoughts on the speed at which the saw blade is moved through the weak layer? Could this affect your results?

Page 9, line 13-15: perhaps you could further address this discrepancy in the weak layer thickness in the Discussion? Or briefly mention here that this was related to the boundary conditions chosen?

Page 13, Figure 8: I found the text to adequately describe the results and comparison to Gaume et al. 2017, would consider omitting this figure.

Interactive comment on The Cryosphere Discuss., https://doi.org/10.5194/tc-2019-97, 2019.