The Cryosphere Discussions

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# Comment on tc-2022-29

Frank Techel (Referee)

Referee comment on "A data exploration tool for averaging and accessing large data sets of snow stratigraphy profiles useful for avalanche forecasting" by Florian Herla et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2022-29-RC1, 2022

Dear editor, dear authors

the manuscript by Herla et al. introduces a novel method that allows the synthesis of a large number of simulated snow cover simulations resulting in an average profile, which can further be queried if an in-depth analysis is of interest to the user. The proposed method builds upon and expands previous research in this direction. Furthermore, the presented algorithm provides a solution to facilitate the interpretation of snow cover simulations for regional avalanche forecasting.

The manuscript is well written, concise, but still easy to follow. The figures are of high quality, supporting the understanding of the described workflow (Fig. 1) and the visualizations obtained with the algorithm (Fig. 2 and 3).

I have three general comments, which I believe would further improve the manuscript:

- On l. 104, the authors state that their testing has shown that the rules applied for initiating the algorithm consistently produced reasonable results. While the described rules (l87-95) do indeed sound plausible, no further detail regarding the testing is provided. - Please elaborate on this testing. For instance, provide a reference if the tests you have made are described elsewhere. What do you mean when you say that "reasonable" average snow profiles are produced? Does reasonable mean that you compared these profiles with observations or is this based on feedback from avalanche forecasters?
- Section 3.2 and Figure 3 show an example of an average snow profile over the course of a season. This example is helpful as it nicely illustrates the potential of the presented algorithm for the analysis of snow-cover simulations at a regional scale. However, from the perspective of a potential user of this algorithm, it would be useful if you could

address the following two points:
(1) In this example, the early part of the season is presented, but the melting season is missing. This makes me wonder whether the algorithm works equally well in spring when the snowpack height and the number of simulated layers decrease with increasing wetting. As the first wetting of the snowpack is highly relevant for forecasting wet-snow avalanches, snowpack characteristics like the advance of the wetting front are very important pieces of information (e.g. Wever et al., 2018). - I suggest expanding the average profile shown in Figure 3 well into spring; or, in case the algorithm is less reliable during the melting period, to mention this limitation.
(2) I personally would have greatly appreciated if this example would have been supported with the (observed) weak layer summary in the region. From what I remember, the main author presented such a comparison at a conference last year (Herla et al., 2021), showing that the average profile captures most of the weak layers tracked by the field observers. While not a full validation, this would help the reader to understand that the average snow profile, synthesizing snowpack simulations driven with an NWP model, captures the most important snowpack features in the region.

Minor comments (line numbers are indicated):

- 1: ...**a** way that **is**... or ...ways that **are**...
- 27-30: rather long sentence. consider splitting
- 28: ...a well-establish**ed** algorithm...
- 31: ...their medoid approach**es...** - does "they" refer to the two references introduced before or just Herla et al.?

I hope these comments are helpful when revising the manuscript.

References:
Herla et al. (2021): Herla, F., Horton, S. and Haegeli, P. Creating regional snowpack summaries from model simulations and
starting a large-scale validation project. Presented at Colorado Snow and Avalanche Workshop 2021 (virtual)

Wever et al. (2018): Wever, N., Vera Valero, C. and Techel, F. Coupled snow cover and avalanche dynamics simulations to evaluate wet snow avalanche activity