The Cryosphere Discussions

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Comment on tc-2022-29

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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-RC2, 2022

Dear editor, dear authors,

the presented brief communication by Florian Herla and collegues describes the use of a specific averaging technique, the Dynamic Time Warping Barycenter Averaging (DBA) in the field of Dynamic Time Warping (DTW) with pure focus on analysing modelled snow stratigraphy. While the appraoch and methods are not novel, it is the first time that these set of methods was applied to modelled snow stratigraphy and to the field of avalanche forecasting. Large parts of the devleopped DTW method for modelled snow stratigraphy were presented in an earlier manuscript by Herla et al (2021). The focus and added value on the presented manuscript compared to the already published content by Herla et al (2021) is on (1) the newly added averaging technique DBA (section 2), (2) some added features on the layer matching appraoch (lines 73-79) and (3) two newly presented sets of figures (Fig. 2 and 3) for better communicating the obtained results.

The text is well written and most of the prestented Figures are clear, easy to understand and enjoyable. Sometimes explanations are a bit to short and due to the nature of a brief communication explanations are sometimes not easy to grasp for an uniformed reader. In addiation, I would suggest improving Figure 1.

Even though parts of the content were already described in Herla et al (2021), I like the idea of this brief communication since the authors focus more on the quality of the results while within the other publication the architecture of the algorithm covered most parts of the reading. Nevertheless, I would expect a little more quantitative presentation on some of the descriptions, which leads me to my four general comments that may improve the quality of the manuscript:

- As stated, Figure 1 is a bit confusing and hard to understand. Could you maybe use less profiles in between and describe the workflow a bit more in detail within the graph. In addition, add some more description within the caption.

- You state that for the DBA it is essential to start the interation by choosing initial condition profiles strategically (line 89). How influential is that condition of the initial profile? Or with other words, if I miss to chose my starting position carefully, does the algorithm support me and is able to find weak layers that I just missed when picking the starting conditions. Can you quantify that by adding some noise to your initial profile?
  Related to that are your statements on the testing. I would like to see some more quantitative results and more in-depth description on how you did that. Reading phrases like (...)consistently produce reasonable average snow profiles suitable for avalanche forecasting. (Line 105), are with low support and not helpful for the interested reader or an avalanche forecaster that wants to apply your findings. In addition, I would be curious what you think is suitable for avalanche forecasting and what is not ;-).
- I like Fig. 2 very much. It will be very helpful in daily routines of avalanche forecasting centers. However, I have some issues with how the content of Fig. 2b was produced. You basically applied the approach by Schweizer and Jamieson (2007) which turned out to be inpropriate or at least less helpful when applied to simulated snow cover data (Monti and Schweizer, 2013). Main reason for that is the fact that the thresholds by Schweizer and Jamieson (2007) were obtained with statistics based on observed snow stratigraphy parameters which may differ compared to simulated ones (especially grain size). That's why Monti and Schweizer (2013) introduced the relative threshold sum appraoch and I would love to see if there are particular differences for the presented example. In fact, I would expect, e.g. the facets below the thick layer of RGs (I assume this to be the slab) to give more indication towards instability. This in turn would give you the option to included FCs as weak layers as well. At the moment the representation of Fig. 2b is heavily driven by grain size only, since the used underlaying snow cover model classifies the weak layer DH and SH mainly based on their size.
- Can you please give some more insights of the model behind the modelled snow stratigraphy data? Are you using SNOWPACK or Crocus?

Finally some minor comments:

- The algorithm seems to work dry snow conditions only? Can you comment on that?
- 1: ...**a** way that **is**... or ...ways that **are**...
- 28: ...a well-establish**ed** algorithm...

I hope the comments are helpful. Congrats to this delightful work.

References:

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