

## ***Interactive comment on “Enhancing the operational value of snowpack models with visualization design principles” by Simon Horton et al.***

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Received and published: 5 February 2020

In this manuscript the authors present a new methodological approach to enhance the operational information value of snow pack models. One of the main developments (that could get even more attention) is the (easy to use) CMAH dashboard tool, providing an online, interactive approach to reproduce the main outcomes/figures of the paper. The authors successfully demonstrate how their approach enhances the information value of snow pack modelling, with particular emphasis of layer prevalence and their spatial distribution. The paper also shows that future research and work is necessary to implement an appropriate measure and visualization for stability. The

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authors succeed in highlighting the spatially distributed character of the results (which could deserve an additional *spatial* description, see comment below). Besides this spatial character it would be worth to elaborate (or at least mention) how this method can be applied with respect to temporal variability. This could e.g. be achieved by (1) evaluating/providing an additional CMAH dashboard for a different date (in mid December?) as supplementary material (if the corresponding workload allows to?) or by (2) briefly discussing how the content and information value changes/develops throughout a season (cf. seasonal variation in Fig 2).

All in all the paper is well written (although the authors could review/explain which and why so many terms are italicized). The paper has a good mixture of technical terms and corresponding descriptions. It is of high quality, enjoyable to read and fits to the scope of NHSSD.

**Please find some detailed line-by-line comments/questions below:**

- *p1 l 8, ...in terrain.:* Please specify on which scale(s).
- *p2 l 1, ...can range from individual slopes in backcountry guiding.:* I do not see how individual slopes are relevant in the context of this work. Is it possible to distinguish?
- *p3 l1, ...so far prevented....:* ... so far limited...
- *p5 l5, ...is analogous to manual snow stratigraphy...:* This is very important and could be further highlighted throughout the paper by providing (a) manual profile(s) representative for the date / location(s) of the main analysis (e.g. 8 January 2018). Further the value of Figure 1 could be enhanced by connecting the snowpack information of the generalized profiles to the study area/time.

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- *p7 117-19*: Could you comment on the specs of the profile locations and how they are chosen/defined to be representative for the study region? Is the number of study plots important? What number is expected to provide a representative analysis for the region (or spatial density)? Since spatial distribution is an important point of your analysis it could be worth to provide a corresponding map overview of the study region and profile locations (in particular for readers that are not familiar with the region).
- *p7 120-25*: Why is the emphasis undesired? Could you elaborate a bit with respect to what some features have high or low importance?
- *p8 17-9, Table 2*: Could you please add some references and comments on the simplified groups of grain types, with particular emphasis on why it would or why it would not be appropriate to summarize RG and FC as bulk layers (with respect to different types of metamorphism / underlying physical process). In your example (see e.g. Fig 2) it could appear also appropriate to add MF as bulk layer?
- *p9 111-12*: Please Specify (see also comment on Figure 4). Are you displaying the percentage for a specific date (8 January 2018)?
- *p11 114*: Could you provide a (technical) reference for the "jitter" plot?
- *p12 110-14*: I think it would be worth to (1) mention the availability of the median values in the interactive dashboard (which are way more instructive than the figure) and (2) to comment on the spatial variability of throughout your profiles, e.g. by mentioning the standard deviation and median values for the expected depth main avalanche problems.
- *p13 16*: Is prevalence really connected to spatial distribution (including all sample pits) or is a total measure of occurrence?

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- *p13 l9-10*: I think it would be worth to shortly discuss why the storm slab (that previously appeared as one of the main problems) is not highlighted in the sensitivity to triggers?
- *p14 sec. 3.5*: I find this section highly instructive to understand figures and conclusions in this paper and would like to see interactive CMAH dashboard mentioned earlier in the paper, since it e.g. provides more instructive/clear visualization than the printed terrain class visualization (Fig 5).

The figures generally appear clear but would benefit from a (more) self-sufficient description (by e.g. referring to the interactive dashboard where applicable and indicating the specific date in all plots/captions (where applicable, e.g. of Fig 2 (right) and Fig 3, 4, 5, 6, 7, 8 )):

- *Figure 1*: Could you enhance this Figure / increase readability and describe which information is given in the generalized snow profile or alternatively provide a manual profile of the study region/time as reference (additionally a map view of modelled study plots could be beneficiary here, see comment below)?
- *Figure 2*: Please indicate/describe somewhere (text and caption) what the difference between the left (timeline of stratigraphy) and right (hardness vs depth for a specific date (which?)) plot are?
- *Figure 3*: It would be helpful somehow give an overview of the study area and where the profiles are simulated.
- *Figure 4, Figure 7*: How can 100% be exceeded (e.g. Nov 24/23 and Oct 22)? Please double check your scale or explain (see comment above concerning prevalence). In the caption - persistent grain types or grain types associated to potential/persistent weak layers (e.g. these are mentioned as weak layer in the dashboard, please double check for the sake of consistency)?

- *Figure 7: ...shows spatial distribution...* Is it really the spatial distribution in this case (like e.g.Fig 5), or rather a total measure of occurrence (see comment above). Would it be beneficial/feasible to also use the size scaling of Fig 6 - allowing for a visual comparison/connection btw. the Figures?
- *Figure 8:* Why are IF not specified/displayed in the dashboard?

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Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2019-344>, 2019.

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