The Cryosphere Discussions

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Comment on tc-2022-34

Edward Bair (Referee)

Referee comment on "A random forest model to assess snow instability from simulated snow stratigraphy" by Stephanie Mayer et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2022-34-RC2, 2022

In "A random forest model to assess snow instability from simulated snow stratigraphy" an ensemble machine learning approach is used to classify instability in profiles from the SNOWPACK model. I enjoyed reviewing this manuscript and recommend that it be accepted subject to minor revisions based on the quality of the work and its importance to advance the field of artificial intelligence in avalanche research. I have a few thoughts for the authors to consider while preparing their final submission.

1)Why are rutschblocks still being used as the test of choice? For example, Schweizer and Jamieson (2010) report unweighted average accuracies of ECTs as 0.81 - 0.95. For the rutschblock, the range is 0.67 - 0.88 when score or release type is used. Using results from a more accurate stability test might improve the performance of the random forest model used here.

2)At 27 pages with 15 figures and 2 tables, excluding the 2 appendices, the article is too long. The Cryosphere is unusually vague in article size limits, but it is expected to fit with 12 journal pages. In any case, the article's length dilutes its important findings, which show that random forests can be used to classify profiles based on stability with high accuracy. Perhaps some of the details regarding hyperparameters and explanation of the widely-used random forest model could be omitted or moved to an appendix.

3)The finding that viscous deformation is the most important predictor is only briefly discussed. This finding deserves further discussion as it highlights how profiles alone are inadequate to classify instability. Loading rate is one of the most important avalanche predictors, stated in Atwater and Koziol (1953) and before. The viscous deformation parameter appears to be an indirect measure of this.

Attached are minor comments as an annotated PDF

NB 6/9/22

Atwater, M. M., and Koziol, F. C.: Avalanche Handbook, 149, 1953.

Schweizer, J., and Jamieson, B.: Snowpack tests for assessing snow-slope instability, Annals of Glaciology, 51, 187-194, 2010.

Please also note the supplement to this comment:
https://tc.copernicus.org/preprints/tc-2022-34/tc-2022-34-RC2-supplement.pdf