# Reply to reviewer comments by Markus Landrø

Frank Techel

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Dear Markus

Thank you very much for reviewing our manuscript and the helpful points regarding improvements.

Please find below a point-by-point reply to your specific comments (your comments in *blue*, our reply **black**):

*Specific comments*

*p1 l21 what about the risk involved?*

The safety of the person performing a test is, obviously, very important when selecting a suitable site. - We will add a statement in this regard.

*p1 l22 what about the radar on skies initiative. Could you comment on that https:// sknow.ski/ ?fbclid=IwAR180DSVe2nRwPwOfDM6b*
*ZC_sfq1j3Aaw*

No, we are unable to comment on this initiative, as we don't know anything about it other than what it says on the website you mention.

*p4 l99: consider adding fatal skier-triggered avalanches.*

The two studies (Schweizer and Lütschg, 2001; van Herwijnen and Jamieson, 2007), which we have cited, explored skier-triggered avalanches in general, not just fatal skier-triggered avalanches.

*p14 l345-358 is there a difference in test performance dependent on weak layer properties (grain type, grain size, weak layer thickness). you probably have this data from the test sites. p4 l102-105: what if the overlaying snow is harder than lets say 1F. Does that have an impact? not theme of this paper, but still. It could also be interesting if you related it to the forecasted avalanche problem.*

In this study, we did not explore the role of the snowpack structure and layering on the test results. However, Winkler and Schweizer (2009), who compared snow stability tests like ECT and RB, also analyzed in detail the respective properties of the failure layers and the slab overlying the failure interface on stable and unstable slopes. They noted that failure layer hardness, failure layer grain type, failure layer grain size and differences in hardness across the failure interface were

significant variables distinguishing between the ECT and the RB failure planes on stable and unstable slopes. For more details, please refer to their article.

*p17 5.4-5.5 consider also relating it to avalanche problems which have become an important part of avalanche forecasting. What when you have low probability and high consequence. i.e. deep persistent weak layer. Another challenge is that on a day of back-country touring you will probably seek the most stable conditions whereas observers will seek the most unstable areas to perform their tests. Especially in situations where you don't have any signs of instability this can possibly bias your slope stability classification in addition to the other sources of error you included.*

Indeed, there is a different focus when undertaking a back-country tour, with the goal to find the best skiing in stable conditions, and when finding a suitable location to perform a stability test (which are often performed in locations where snowpack is thinner, and therefore likely weaker).

More specifically regarding our study: We don't know whether a snow pit location represented the surrounding terrain well. It is one of the potential error sources, which may influence the quality of our slope stability classification. While this is currently addressed in a rather general way in the statement on lines 402-404, we will add a more specific comment in this regard.

*You have not addressed vertical vs lateral tapping and the energy absorption due to deformation of the upper snow layers above the weak layer. https://arc.lib.montana.edu/snow-science/item/2673*

We have not compared vertical vs lateral tapping, as both tests are loaded vertically from the top. Therefore, we do not discuss these.

*Technical comments*

Thank you for pointing these out, we will address them as suggested.

## References

Schweizer, J. and Lütschg, M.: Characteristics of human-triggered avalanches, Cold Reg. Sci. Technol., 33, 147–162, doi:10.1016/s0165-232x(01)00037-4, 2001.

van Herwijnen, A. and Jamieson, B.: Snowpack properties associated with fracture initiation and propagation resulting in skier-triggered dry snow slab avalanches, Cold Regions Science and Technology, 50, 13–22, doi:https://doi.org/10.1016/j.coldregions.2007.02.004, 2007.

Winkler, K. and Schweizer, J.: Comparison of snow stability tests: Extended Column Test, Rutschblock test and Compression Test, Cold Regions Science and Technology, 59, 217–226, doi:10.1016/j.coldregions.2009.05.003, 2009.