

The Cryosphere Discuss., referee comment RC1
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Comment on tc-2022-27

Anonymous Referee #1

Referee comment on "Environmental Conditions for Snow Cornice Formation tested in a Wind Tunnel" by Hongxiang Yu et al., The Cryosphere Discuss.,
<https://doi.org/10.5194/tc-2022-27-RC1>, 2022

Investigations of snow cornice development is worthwhile since its collapse is strongly related to the snow avalanche release; I cannot agree with you more. In this study, the leading-edge technology including the closed-circuit wind tunnel and the shadow graph imaging technologies. I appreciate very much for the efforts by authors. However, that is all. Similar experiments in the wind tunnel were carried out more than 35 years ago by a master student as shown below and much more meaningful outcomes were obtained.

Naitou, A. and Kobayashi, D., Experimental Study on the Generation of a Snow Cornice, Low temperature science. Series A, Physical sciences, 44, 91-101, 1986.

https://eprints.lib.hokudai.ac.jp/dspace/bitstream/2115/18521/1/44_p91-101.pdf

Unfortunately, the text is written in Japanese. However, it cannot be an excuse, since English summary is attached, in which the wind speed of 4 to 8 m/s is suitable for the cornice formation, and the capture coefficient of drifting snow is also referred. Incidentally, I suppose some of the authors can recognize Chinese characters and are understandable what is mentioned in the test as well more or less. Please read through carefully. Dependencies on not only the air temperature but also crystal shape, which are listed as the future work in the submitted manuscript, have been already studied. Thus,

from my point of view, nothing looks new and no findings which deepen our understandings of the snow cornice formation mechanism are introduced in the submitted manuscript.

Further, the discussions, in which authors argue the similarities between the wind tunnel experiments and the observations in the fields, look odd. As is common for the researchers working on blowing/drifting snow, the blowing threshold wind speed in nature is around 5 m/s at 2 to 3 m high (not 11 m/s !), which roughly corresponds to the friction velocity of 0.2 to 0.3 m/s. If you assume, $U_t 0.4m = 3.2$ m/s in the wind tunnel corresponds to $U_t 2.8m = 11$ m/s in the field, friction velocity and the roughness length will be calculated extremely large (roughly $u^* = 2.4$ m/s, $z_0 = 0.235$ m !!; in usual former should be 0.3 to 0.4 m/s and the latter the order of 10⁻⁴ m). Thus, discussions below line 175 in this manuscript sound meaningless.

Preferably, missing link between the 4 cm long and 5 mm thick cornice observed in the wind tunnel and the several-meter scale of cornice formed leeside of the mountain ridge should be also referred to answer the motivation in the introduction part.