Dear Yves,

We are very grateful for your careful read of the manuscript and acknowledging the contribution to an understudied part of the cryosphere in HMA. We have considered all the suggestions made and respond to them individually below, with our response marked in red.

The paper entitled «Snow and ice avalanches in high mountain Asia – scientific, local and indigenous knowledge» reviews the known avalanche events in high mountain Asia, develops a database and discusses mitigation strategies. This is a very meaningful and important contribution to a topic not yet well investigated in this region. Therefore, I would recommend this paper for publication after adding some more important sources and improving some figures as well as an extended discussion on avalanche hazard indication mapping. Her are my specific inputs:

Abstract:

L 24: you mean more densely populated right? I think the European Alps are by far more populated than HMA. You write "in the less populated European Alps" is this a mistake?

Delineations of mountain areas and hence their associated populations are difficult and there exists no one consensus (Thornton et al. 2022). But considering that Nepal alone, which in many definitions falls completely within HMA) has 30 million inhabitants, Tibet more than 3 million, Gilgit Baltistan 1.5 million, Tajikistan ca 10 million, Kabul at 1800 m a.s.l. 4 million etc. we think HMA has indeed more people than the Alps, which in the delineation of the Alpine Convention stands at 14 million[1]. In both cases these areas include land that is relatively low (Kathmandu, Luzern etc) but fall within the global delineations. We are not so sure if can make a blanket statement on density as that would vary within the regions considerably.

Introduction:

L75: Here I would propose to add some more important references on avalanche mapping by remote sensing as they bare a big potential for future applications in HMA: (Lato et al., 2012; Eckerstorfer et al., 2019; Bühler et al., 2009; Korzeniowska et al., 2017; Bühler et al., 2019)

Thanks for these added suggestions. We have included this and refer to it further in the Discussion.

---

[1] https://www.alpconv.org/en/home/topics/population-and-culture/

Recorded   snow   and   ice   avalanches:

L250: Fig 3 is not well readable, in particular the legends must be larger.

L255 Fig 4 is also only poorly readable, the fonts must be bigger.

Thank you, this has been adapted.

Discussion:

Here I miss a discussion on hazard maps and hazard indication maps. For he Alps, approaches have been developed to automatically generate hazard indication maps based on digital elevation models (Bühler et al., 2022; Bühler et al., 2018). Such approaches would be very helpful for HMA regions. Also, more simple approaches such as slope angel maps would be helpful for the planning of mitigation measures and could have a high impact. This should be discussed in more detail. Are there existing hazard indication maps for HMA? As far as I know the Aga Khan foundation is also doing hazard indication mapping for avalanches for example in Afghanistan.

Thank you, we now expanded the discussion here considerably, would however like to note that it is simply also a lack of responses to avalanche hazards in the region that makes this difficult to fill. Future work on proposed ways forward for the region would be definitely welcome and we have noted that in the Conclusion as well.

References

Bühler, Y., Hafner, E. D., Zweifel, B., Zesiger, M., and Heisig, H.: Where are the avalanches? Rapid SPOT6 satellite data acquisition to map an extreme avalanche period over the Swiss Alps, The Cryosphere, 13, 3225-3238, 10.5194/tc-13-3225-2019, 2019.

Bühler, Y., Hüni, A., Christen, M., Meister, R., and Kellenberger, T.: Automated detection and mapping of avalanche deposits using airborne optical remote sensing data, Cold Regions Science and Technology, 57, 99-106, 10.1016/j.coldregions.2009.02.007, 2009.

Bühler, Y., von Rickenbach, D., Stoffel, A., Margreth, S., Stoffel, L., and Christen, M.: Automated snow avalanche release area delineation – validation of existing algorithms and proposition of a new object-based approach for large-scale hazard indication mapping, Natural Hazards and Earth System Sciences, 18, 3235-3251, 10.5194/nhess-18-3235-2018, 2018.

Bühler, Y., Bebi, P., Christen, M., Margreth, S., Stoffel, L., Stoffel, A., Marty, C., Schmucki, G., Caviezel, A., Kühne, R., Wohlwend, S., and Bartelt, P.: Automated avalanche hazard

indication mapping on a statewide scale, Nat. Hazards Earth Syst. Sci., 22, 1825-1843, 10.5194/nhess-22-1825-2022, 2022.

Eckerstorfer, M., Vickers, H., Malnes, E., and Grahn, J.: Near-Real Time Automatic Snow Avalanche Activity Monitoring System Using Sentinel-1 SAR Data in Norway, Remote Sensing, 11, 10.3390/rs11232863, 2019.

Korzeniowska, K., Bühler, Y., Marty, M., and Korup, O.: Regional snow-avalanche detection using object-based image analysis of near-infrared aerial imagery, Nat. Hazards Earth Syst. Sci., 17, 1823-1836, 10.5194/nhess-17-1823-2017, 2017.

Lato, M. J., Frauenfelder, R., and Bühler, Y.: Automated detection of snow avalanche deposits: segmentation and classification of optical remote sensing imagery, Natural Hazards and Earth System Sciences, 12, 2893-2906, 10.5194/nhess-12-2893-2012, 2012.