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Comment on essd-2022-228

Jan Kavan (Referee)

Referee comment on "Multi-hazard susceptibility mapping of cryospheric hazards in a high-Arctic environment: Svalbard Archipelago" by Ionut Cristi Nicu et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2022-228-RC1>, 2022

Review – Nicu et al. 2022 „Multi-hazard susceptibility mapping of cryospheric hazards in a high-Arctic environment: Svalbard Archipelago“

The authors present a detailed inventory of thaw slumps (TS) and thermo-erosion gullies (TEG) of a central part of Svalbard archipelago in the High Arctic. As such, the database is rather unique and can serve for multiple purposes ranging from further research of cryosphere related processes to actual mitigation actions of local policy makers. In general, the paper is well written with no important issues that would cause serious problems in using the database.

My biggest concerns are related to reliability and quality of source data and the necessary generalisation within the modelling process. However, authors included a detailed discussion of the limitations (especially in section 4.3). This includes also the factor of geology/bedrock which, in my opinion, is the principal controlling factor affecting spatial distribution and main parameters of both TS and TEG.

I have several major comments, which I would like the authors to answer and possibly adjust in the paper.

a/ I understood that the NPI aerial images were used for delimitation of the TS and TEG. Beside this you described that you had several extensive field campaigns including UAV mapping and dGPS measurements – this seems not to be used any further in the process. Can you comment on that?

b/ I miss any information on the minimum length/area of the features that are included in the database – I guess this is related to the spatial resolution of the aerial images.

c/ It might be good to include some measure of uncertainty in the delimitation process – this is related to the resolution as mentioned above.

d/ I wonder if some estimate of volume of the mapped features could be included in the database. I think that the area of TEG is interesting, but the volume of transported material might be even more beneficial for example for policy makers when planning mitigation actions in the settlements.

I was actually expecting that the UAV flights were intended for volume estimation. This might be also done using 2m resolution ArcticDEM for larger features. I am completely aware that it would need a lot of time to be done for the whole dataset, but at least for a few sites perhaps?

e/ Would it be possible to quantify the importance of controlling factors? In a very simple way with use of PCA or similar statistical approach? That would be a nice outcome of the whole work.

f/ Do you think that the model calibrated on the data from Nordenskiöldland could be easily used in other parts of Svalbard or elsewhere? Can you comment on that in the discussion?

g/ I would suggest including other derived parameters of the mapped features directly in the database as an attribute of the shapefiles (area, slope, aspect, centreline length, bedrock type and so on). I guess you have these data and others might benefit from that without need to proceed the analyses on their own. In the TS attribute table an “age” column is included with values 1 or 2 – can you explain that?

Technical comments:

a/ please include scale in Fig 1 and 2.

b/ please doublecheck the reference list, I wanted to look at Myhre 2022 (in Table 1), but it is missing in the references

c/ I would suggest marking where the settlements are located in Fig 7 and 8 – that might help the readers not familiar with Svalbard.

d/ it might also help redesigning Fig 8 and enlarge the Z1, Z2, Z3 + insert schematic infrastructure (buildings, roads) to illustrate how does the susceptibility interact with actual existing infrastructure