We thank the reviewer for her/his valuable comments, which will help us to clarify our technical note. Below we respond (in blue) to the reviewer comments (*in black*)

This paper presented a medium-complex glacier melt module and its combination with the HBV model. The idea is good and practically possible. This manuscript will be helpful for beginners of hydrological modelling in glacierized catchments.

We appreciate this positive assessment and actually assume that the paper will also be useful for more advanced modelers, who are faced with the challenge of simulating glacier dynamics in bucket-type hydrological models.

However, when I try to follow its instructions, I get lost because some critical problems are not clear. And the comparison with previous studies is not well addressed. First of all, the required data should be indicated before the implementation of the model.

We will clarify the data requirements. Beyond the data needed for the hydrological modeling, i.e., precipitation and temperature and potential evaporation, one needs topographic information and the initial areal extent of the glacier(s) as well as an initial thickness profile.

Compared to study of Luo et al. (2012), what is the superiority of the Δh parameterization method? Why do you choose the Δh parameterization method compared to volume-area scaling?

With the volume-area scaling no catchment-specific information is considered, whereas the Δh parameterization allows considering elevation distributions and the thickness profile. In volume-area scaling any volume change directly translates to area changes, although this has not always to be the case (think of two glaciers with the same volume but different thicknesses in their lower part). The Δh parameterization also allows attributing the glacier area changes to the different elevation zones, which would not be directly possible with a simple volume-area scaling, which does not allow to assign the region of glacier shrinkage (see also the discussion in Stahl et al., 2008). As discussed by Huss et al. (2010) the Δh approach is a simple but still physically based approach to consider changing glaciers.

The statement "The Δh parameterization method is used to generate the volume-area relationship (Page 4 line 28)" is biased, as the Δh parameterization is used to generate the spatial distribution of Δh based on relative elevation.

We will clarify that we here mean that the Δh approach is used to generate the volume-area relationship for the specific catchment (i.e. the relative elevations from the Huss-equations are transferred to real elevations for this particular setting)

Page 5 Lines 23 - 31 The relationship of Δh and mass balance change should be indicated more clearly.

A certain mass balance change over the entire glacier area is distributed to the different elevation zones using the empirical Δh parametrizations from Huss et al. (2010) – see also the detailed description in Huss et al (2010). However, we can include more information if required.

How to account for the snow redistribution effects?   Could you provide the detailed information, for example, with equations?

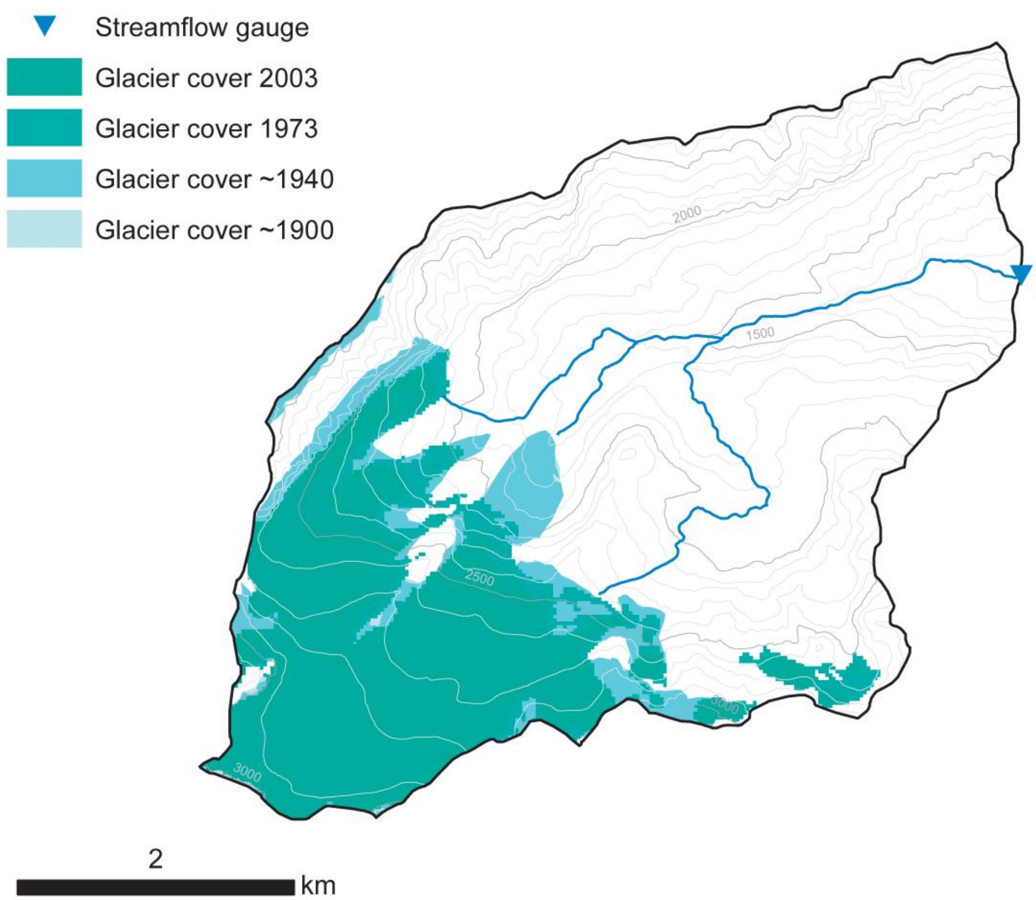
Snow redistribution is an important issue, although not the focus of this technical note. Basically, for higher elevations a threshold was defined in HBV and all accumulated snow exceeding this threshold is redistributed to lower elevations. This is already described on page 4, lines 17-22. We aware that our approach is a very simple representation, on the other hand, snow-redistribution also is not the focus of this technical note. Basically we are assuming that the high-altitude non-glacier areas correspond to preferred snow-erosion sites and glaciers and lower-altitude zones correspond to preferred snow transport accumulation sites.

Will the glacier dynamic module take the "equilibrium line altitude" into consideration?

This is done implicitly by the Δh approach, but the ELA is not used explicitly

Provide a map to illustrate the study area in the case study.

While we agree that maps are in generally helpful, we hesitate to add a map to this technical note. After all the Alpbach catchment is only used as example. However, if required, we could add map like the one below.



There is only one glacier located within the Alpbach catchment, which is not convincing though Δh has been successfully incorporated into WASA in Duethmann et al (2015).

The glacier routine presented here was successfully applied to 49 diverse catchments in the Swiss Alps with many of them also having mor than one glacier (see Stahl et al. 2017). We intentionally selected only one catchment with one main glacier for demonstration purposes for this technical note.

Stahl, K. et al. 2017: The snow and glacier melt components of streamflow of the river Rhine and its tributaries considering the influence of climate 30 change, Final report to the International Commission for the Hydrology of the Rhine Basin (CHR). [online] Available from: www.chr-khr.org/en/publications

Line 6 on Page 4: The sentence "which represents the different albedo of ice compared to snow and typically takes values of about 1 to 2" indicated that glacier melt factor is 1-2 times of snow melt factor. Is it universally true? This need to be verified. How about the debris cover area?

Thanks for pointing out that we missed to acknowledge the source of this information. Hock (2003) reviewed numerous studies and our factor is based on her Table 1.

Hock, R. (2003). Temperature index melt modelling in mountain areas. Journal of Hydrology, 282, 104–115. http://doi.org/10.1016/S0022-1694(03)00257-9

Debris cover is not an issue in this catchment, but modelers can consider the effect if necessary by adjusting the degree-day factor for ice-melt

Page 5 line 16: "the conversion of snow to ice takes about 1-3 years" needs references.

We thank for this questions which made us realize than we were not very exact in our description. What we meant was that it takes 1-3 years until snow is transformed to firn (https://nsidc.org/cryosphere/glaciers/questions/formed.html). The further transformation to ice varies with climatic conditions and can take 10 to more than 100 years. However, when simulating melt rates, we here treated the firn as ice when simulating melt rates. One can also note that this approach and even the used parameter value agrees with the approach used fir the snow-firn(ice) conversion by Luo et al. (2013).

Page 9 line 27: I am not clear about how will the glacier retreat. When Δh is larger than or equal to the thickness of the glacier borders, the glaciers for the corresponding area will disappear?

Yes exactly, as described in the last paragraph on page 5 (following Eq. 6): if the computed change in an elevation interval is larger than the remaining ice, the glacier will be reduced by the corresponding area. In addition the glacier area will also be (slightly) reduced for higher elevations when the thickness is decreasing (Eq. 7).

Page 9 Line 3: this sentence "This is due to the Δh-approach, which distributes the change in glacier mass balance over the different elevation zones, in combination with the implemented width scaling, which relates a decrease in glacier thickness to a reduction of the glacier area" is confusing. The Δh-approach is used in combination with the width scaling in this case study? The details should be illustrated in model setup section.

We agree that this is a bit confusing and will try to clarify this in the revision. While in the original Δh-approach the glacier area is reduced only from the lowest elevations, we added an area reduction at higher elevations when the thickness in these zones decreased to improve the realism of the glacier area changes.

The idea of classification of "aspect classes" seems to be a very useful conduct? What are the glacio-hydrological effects?

The use of aspect classes will cause the ice and snow melt to be faster or slower and, taken together, to spread over a longer time period. This approach has been used previously, for instance, in the ETH version of the HBV model (e.g., Hottelet et al., 1993; Hagg et al., 2007).

Hottelet, C., Braun, L. N., Leibundgut, C. and Rieg, A.: Simulation of Snowpack and Discharge in an Alpine Karst Basin, in Snow and Glacier Hydrology (Proceedings of the Kathmandu Symposium, November 1992). IAHSPubl.no. 218, pp. 249–260., 1993.

Hagg, W., Braun, L. N., Kuhn, M. and Nesgaard, T. I.: Modelling of hydrological response to climate change in glacierized Central Asian catchments, J. Hydrol., 332(1–2), 40–53, doi:10.1016/j.jhydrol.2006.06.021, 2007.

References: Luo, Y., Arnold J., Liu S., Wang X. & Chen X. 2013 Inclusion of glacier processes for distributed hydrological modeling at basin scale with application to a watershed in Tianshan Mountains, northwest China. Journal Of Hydrology 477,72-85.

We thank the reviewer for making us aware of this interesting paper.