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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Technical Note: Representing glacier dynamics in a semi-distributed hydrological model" *by* Jan Seibert et al.

Anonymous Referee #1

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Comments on "Technical Note: Representing glacier dynamics in a semi-distributed hydrological model"

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. 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.

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?

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.

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

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

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

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

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?

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

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?

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.

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

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.

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