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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Importance of snowmelt contribution to seasonal runoff and summer low flows in Czechia" *by* Michal Jenicek and Ondrej Ledvinka

Anonymous Referee #2

Received and published: 22 February 2020

The paper presents how snow processes influence runoff generation in mountainous catchments in Czechia. The presented results are not novel, and similar things have been shown across different regions. However, the manuscript could still be a valuable contribution for the readership of HESS. The overall structure of the manuscript is quite clear, but inconsistent language makes the paper sometimes hard to follow, especially throughout the introduction and discussion. Below I suggest some changes that should be considered prior to publication.

At this point, I am not convinced by the conclusion that "snow is more effective in generating catchment runoff compared to liquid precipitation". First of all, it is not clear

what I actually see in Figure 3: Did you plot the mean of both groups (snow rich and snow poor) for every catchment? Please add some information to make this clearer. Second, I'd like to see the same calculations (Figure 3) with the absolute values for total snowmelt runoff and total snowfall precipitation as 26% (on average) of total runoff might still be less than 20% (on average) precipitation. Also the increasing trend with elevation in my opinion is not visible in the results. There needs to be further analysis (maybe cluster in elevation groups) to convince readers. I understand that some of these results are also supported by the HBV modelling. However, you need to more explicitly convince readers that snow vs. rainfall processes can be well separated in the current modelling setup.

A better characterization of the catchments (i.e., the runoff regimes, precipitation and runoff seasonality) is warranted. This will help to better emphasize why these results are valuable and why it might be useful to show the results for these specific study regions. To people who are not familiar with topography and hydroclimatology of Czechia it would be very helpful to have more "background" information on the study catchments. Please add a table with information on mean, max, min size, elevation, precipitation, temperature, discharge,... What are the main differences between the regions, and the four sample catchments? This is important to interpret the results afterwards (some of them are shown based on the different sample catchments). If I interpret the DEM correctly your highest peak is only 1602 m a.s.l., some of the catchments are far below 1000m in peak elevation, do they even have snowfall / accumulation every year? I find it difficult that, in the discussion section, you interpret the results based on the different regions, however they are not well characterized.

Detailed comments: line 98 you claim that the selection criterion is timeseries >35 years however in line 104 /105 you write that three catchments do have less data

line 125 although I tend to believe that annual precipitation, peak SWE did not change significantly it would be great to see this (maybe in a table in the supplementary)

line 155 what is the range of threshold temperature throughout the catchments?

Section 3.1 is not overly informative, in my opinion it can be moved to the supplement.

Figure 4 (and Figure 8): catchments are sorted by “mean” elevation, also add an arrow and write elevation next to y axis, and at least give starting and end value (115m a.s.l. to 1602m a.s.l.)

Figure 4 (and Figure 6): make it clear, that you show the results for four specific catchments maybe by using the catchment names as headlines for the subpanels)

Figure 5 and Figure 7: make sure that you use different color coding, as you show different things (in Figure 5 Sf and in Figure 5 the regions)

Figure 5 please mention the abbreviations (as in the axis titles) also in the figure caption

Figure 7 is a bit confusing: In panel (a), do you show a point for each catchment where x is the mean of baseflow from all years having below average summer precipitation and y is the mean of baseflow from all years having below average SWEmax? If that is what I see in Figure 7a, than 58 out of 59 catchments have below average summer baseflow when they experience below average summer precipitation. However, only 40 out of 59 catchments had lower summer baseflow when having lower SWE, which is not supporting your conclusion on the importance of SWE. Please revise this figure (and its caption) to make it clear what is shown.

In Figure 8 please consider using the same scale for the color bars to make the panels comparable.

Discussion: You mention data errors in the headline of 4.1 but you did not discuss them.

You need to better emphasize the challenges when separating liquid from solid precipitation within the HBV modelling framework. Maybe you can discuss the implications on your results a little more detailed.

The contribution from groundwater calculated with HBV is quite uncertain, you could also be looking at generally higher storage potential at higher elevations. Maybe you could consider discussing these uncertainties.

You mention a lot of interesting differences between the regions / catchments in the discussion, maybe you can add more information at an earlier part of the manuscript and build your story on these different regions.

Conclusions: I’d appreciate if you could relate the statements with the according figures, that makes it easier for the reader to recap on where to find the evidence for the conclusions

The second objective (lines 86 & 87) is to show the importance of snowmelt “at different elevations”, however elevation differences where not really mentioned and I also did not find any concluding remarks regarding this statement.

I am also not convinced that I saw results that support that “future liquid precipitation will not compensate the lower solid precipitation”, please re-write or leave out.

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