

HESS-2021-44

Reply to Anonymous reviewer #2

Review of “Hydrological response to warm and dry weather: do glaciers compensate?” submitted by Marit van Tiel, Anne F. Van Loon, Jan Seibert, and Kerstin Stahl to Hydrology and Earth System Sciences (HESS)

I found this study interesting and well-written. The findings are novel and the methodology is clear. My one concern is with the portion of the study dealing with glacier mass balance – which has already been brought up by in the review by Mauro Fischer, see my further general comment on this topic below.

The detailed review by Mauro Fischer caught most of the minor and technical comments that I would have included in my review. To save the authors time in responding to duplicate comments, I will not repeat them here. The few comments below are those I have tried to prune for overlap with Mauro’s review. I enjoyed reading this study and, in my opinion, it is worthy of publication in HESS with some minor revision.

>> We thank the reviewer for this positive evaluation. Please find below our replies in blue and italic.

General Comments

Like the other reviewer, I have concerns about using the median of measured mass balance data. Using the area-weighted average, as has already been suggested, is a better option and has already been demonstrated in the response from the authors. I recognize the data limitations the authors are contending with, and I wonder if the mass balance analysis could just be removed from the study. I understand why the authors would like to include this type of analysis, but, in my opinion, it is a very minor part of the study and novelty and importance of the manuscript would not be hindered by removing this small piece. It would be a great avenue for future research. I will leave it up to the authors to decide whether a revised version of the mass balance analysis with the area-weighted averages should or should not be included in the revised manuscript.

>> Yes, both reviews made us aware that area-weighted mass balances should be used instead of the median. Given the data limitations, the reviewer suggests leaving the analysis out of the current study. We agree with the reviewer that it is only a minor part of the study. The study illustrated that on these spatial and temporal scales, the available glacier mass balance data has varying relations with the compensation level and attribution is difficult. We agree that this attribution and the connection between glacier mass balance data and streamflow responses is an excellent avenue for future research.

Now we have two opinions: we can follow reviewer #1, indicating that it is an important part of our study and we should use area-weighted mass balances time series, preferably subdividing the glacier mass balance observations and catchments into more climatically similar regions (northern and southern slopes of the Alps, west and east). Alternatively, we can follow reviewer #2 who suggested leaving this part of the study out because it is only a very minor part.

We have a slight preference for leaving the glacier mass balance analysis out of the study and will change the manuscript accordingly.

Specific Comments

Discussion:

Two sections in the discussion seem to overlap: ‘5.3 Drivers of Event-to-event variability in compensation levels’, and ‘5.5 Temporal variability in event responses’. Both sections are discussing results presented section 4.4 (drivers of event-to-event variability). From the headings, it is not clear to me what the difference is between the two sections. I suggest combining the two sections into one.

>> Indeed, both sections discuss the findings of Section 4.4. In 5.3 we discuss the effect of the conditions of the event on the compensation level (antecedent conditions, duration and temperature). In 5.5 we discuss temporal effects, thus the difference between the different months and the impact of trends. However, since the conditions also vary for the different months, the difference between the two subsections may have become obscure. We suggest to make one section out of it called ‘Drivers of event-to-event variability in compensation levels and monthly differences’, in which we combine the conditions and the monthly/seasonal effects and add the trend discussion.

There are several places in the discussion where I found myself wanting a reference back to the relevant results. Below I’ve listed two locations. In my opinion, cohesion through the manuscript would be improved by adding a few figure, table, or section references to the discussion.

Line 381 – refer to the results supporting this stated finding.

Line 438-439 – refer to the results supporting the stated finding

>> Thank you for pointing that out. In the revised version, we will add references to figures, tables and preceding sections to the discussion.

Other minor comments:

Figure 1 and Figure S1: Are there just two line thicknesses used in these figures? What gc values do these thicknesses correspond to? What is the break value?

>> Do you mean Figure 2 and Figure S1? The link thickness scales with the relative glacier cover, so there are many different line thicknesses. We will adjust this in the legend and caption to make it clear.

Figure 2 – Add a legend to clarify the relation between color and region.

>> We will add this.

Figure 8 – What are the glacier cover classes? Perhaps just list them in the caption.

>> The glacier cover classes are given in the top-left figure. We will add them in the complete first row or, indeed, list them in the caption to make it more clear.

Table 3 – Heading should be ‘Average duration of events [d]’?

>> Indeed, this will be changed in the revised version

Line 270: Missing comma in sentence starting with ‘All variables,’

Line 393: ‘and follow up studies Moyer et al. (2016)).’ Seems like part of this sentence is missing

>> *Thank you for pointing these things out. We will change this in the revised version*