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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Climate change impacts model parameter sensitivity – What does this mean for calibration?" *by* Lieke Anna Melsen and Björn Guse

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We would like to thank the reviewer for the suggestions to improve the manuscript. Below a point-by-point response.

1) Agreed, we will expand the literature in the introduction.

2) We will expand the description of the methodology. Furthermore, we will add a summary of the direct model output (the different states/fluxes) by means of a boxplot to provide more insights on model functioning.

3) We think we do not completely agree with the reviewer at this point, although the

suggestion can be read in two ways.

The goal of this study is to evaluate if within a plausible climate change rate, parameter sensitivity changes. Evaluating variations in sensitivity at the seasonal and event scale is therefore out of the scope of this study – for this we refer to the discussion.

The reviewer suggestion also be read as a suggestion to evaluate timing-metrics beyond the mean discharge within the climate change context. This would indeed be interesting and valuable, but since we consider this study a 'proof of concept' we limit ourselves to the most straight forward metric – mean discharge. The reviewer is correct that parameter sensitivity depends on the metric of interest – indeed SCF in HBV will logically have substantial influence on the water balance in snow-dominated catchments. That is for the sensitivity itself. However, the change in sensitivity can in this case most likely be assigned to climate change. We evaluated two 23-year periods, with only the climate changed.

Indeed, when evaluating other metrics, other parameters might appear sensitive or demonstrate different changes in sensitivity. We totally agree that this is an interesting research line. We also acknowledge that we do not stress enough yet, that these results are only valid for mean discharge, and that for other (e.g. timing or event-related) metrics results might differ - we will emphasise this better. The main conclusion remains valid though: when using models for climate change impact studies, care should be taken in the calibration.

4) Agree, we will add this to the manuscript. This aligns very well with the suggestion under point 2, for which we will add the boxplots demonstrating the fluxes and states of the different models.

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