Interactive comment on "Mapping (dis)agreement in hydrologic projections" *by* Lieke Melsen et al.

Lieke Melsen et al.

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Dear Dr Kiesel,

Thank you very much for your positive and constructive review. Please find below a short response to a selection of the points raised by you. We only respond to the points that caused confusion in understanding the manuscript, please let us know if anything remains unclear or if you disagree. We plan to incorporate all your suggestions if we get the opportunity to revise our manuscript.

Best regards,

on behalf of all co-authors, Lieke Melsen

*p.3 Fig 1d is not clear to me: why two bars in the upper positive change section? What is the black line with the two points and how is it created? Why is 'Frequency' written

below the box?

The changes from the six points compared to the 1:1 line in Figure 1c are summarized in a histogram as shown in figure 1d. This histogram is turned 90degrees, and therefore frequency is shown on the x-axis. The black line shows the mean change from the distance from the six points in 1c to the 1:1 line. We will adapt the caption to make this more clear.

*p.5 l.20: what is meant by "member" (i.e. what distinguishes the different 'members' of each GCM family - regional climate model, version, resolution, year, ...)?

Knutti et al (2013) defined GCM families based on their output: "based on the predicted change in temperature and precipitation fields for the end of the 21st century in the RCP8.5 scenario relative to the control." (Figure 1 in Knutti et al., 2013). By selecting one member (GCM) of each GCM-family, we approach the full range of projections by all GCMs. We will add this to the text.

*p.6 l.12: I assume number of "representative sample of parameter sets" is defined through the behavioural runs. For the other two uncertainty sources we know the number (three for the hydro models, five for the GCMs) - but for the chosen parameter sets you do not show them. However, I think it matters how many runs in each catchment are used to produce all the subsequent results. Could you show three additional maps of the CONUS (could also go to the Appendix) where the color of each catchment dot indicates the number of behavioural runs for each hydrologic model?

Yes, we can definitely do that, thank you for the suggestion. It actually also provides relevant information; generally speaking, the regions where there is disagreement based on parameters, are the regions where a large number of parameter-sets was considered behavioural (probably, because these regions are generally speaking quite wet, which is, again generally speaking, easier to model).

*p.8 l.7-8: Is this result not better suited for the section 3.2.1?

We think not, because these results specifically refers to parameter-disagreement, for a specific model. We admit, however, that this can be confusing, and will add a sentence to explain. It is, indeed, not always a clear distinction between what is part of parameter uncertainty and what of model structure, as parameters are representatives of the model structure.

*p.11. l.29: a lower aridity? Figure 5.d. suggests higher aridity? how can aridity be both high for disagreement and non-behavioural catchments?

Thank you, it should indeed be higher aridity. The aridity can be higher for both the disagreement and non-behavioural catchments because for the analysis in the rose-plots, each group is compared to the total of the other groups (in other words; the disagreement-group is compared to all other groups, so the agreement and the non-behavioural group together). This indicates that the aridity in the agreement-group is so much lower, that it results in a significantly higher aridity for both other groups.

*also at Figure 7.d: the significance triangle for mean delta P should point down and be hollow or? Seems like I have difficulties understanding the rose plots. If the plots are correct, I require more explanation how they need to be interpreted (e.g. already in the methods with an example rose plot).

Thank you, we understand the confusion here, mean delta P should indeed be a downward hollow triangle. I think this is a remnant from an earlier analysis, where we also still accounted for the non-behavioural basins in this analysis; these basins on average experience a lower change in delta P. We will adapt the figure. The other results in the figure are correct.

*p.15 l.10: This chapter is a very good summary of the uncertainties. But I miss that you explain how the combined uncertainty is produced in the methods. Did I miss something?

There was not really any more methodology involved rather than what is explained

in the caption of Figure 9; For figure 9, we combined all the previous figures in the manuscript (plus all the figures in the appendix to account for the different models) and determined the most frequent sources-of-uncertainty-combination. We will add this explanation to the methodology.