

## ***Interactive comment on “A comparative analysis of projected impacts of climate change on river runoff from global and catchment-scale hydrological models” by S. N. Gosling et al.***

**H. Cloke (Referee)**

hannah.cloke@kcl.ac.uk

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This paper is extremely well written and contains some important research and useful discussion. The paper demonstrates future runoff projection comparison of global and various catchment modelling approaches over catchments with varying properties. Overall I think the paper is certainly publishable subject to some minor points detailed below:

1. A missing step is perhaps to compare like with like – catchments using the same catchment model and groups of similar catchments. I imagine due to the size of this

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task (time/computer and person power) this was not undertaken – but some brief commentary about how a completely thorough test could be done would be useful. It would be helpful to give more information on the computational resource (nodes, speed etc.) required. I’m guessing a full uncertainty approach was impossible because of this problem. Could be further discussed.

2. I cannot see any baseline comparison of the precipitation that is being fed into the hydrological models, especially on a catchment integrated basis. It is difficult to compare the outputs if you do not have a benchmark comparison of the inputs. Can you provide this as figures/table?

3. The discharge results are not presented along with the known performance or bias with observed-baseline projections (as it would also be useful to do for precipitation). How well do the models perform compared to observed data? Obviously this does not guarantee good performance for future datasets and indeed calibrations may not be optimal in a future state. Some discussion on this would be useful as well as a description of bias/performance of models.

4. The time period of runoff projections is not clear throughout the text.

5. You have only used one type of GHM. Worth discussing. What are the uncertainties because of this? Do you think your conclusion that GHMs are equally feasible to apply as CHMs stands up for all cases? I think you undersell the GHM in your text. You have some good evidence that it can be used for this type of assessment. Cite it clearly and sell your conclusion that GHM is useful.

6. The sensitivity of the ClimGen/weather generator downscaling approach is not discussed. This is not the only approach to downscaling (e.g. Maraun et al 2010 Reviews of Geophysics doi:10.1029/2009RG000314) – and of course adds further uncertainty into your results. What might be the ‘true’ uncertainty bounds for your results? Can you discuss this? Surely they are bigger than those shown in figure 8. Can you be explicit about all of the different components that go to make up the total uncertainties in your

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results – what are they and how big are they relatively speaking?

7. For the discharge, I would have thought that also looking at the whole discharge distribution would be interesting at the catchment scale. Did you consider this at all?

8. End of section 3.1: If there was no catchment for which all 7 GCMs agreed on ppt change then what is the point of carrying out the hydrological analysis. Think that you need to make your story more concrete here and discuss this point. Are the signs of the runoff response shown in the results directly attributable to the catchment precipitation used as input? If there was a more thorough front end analysis of the precipitation (as suggested above) then this would probably be more obvious.

9. Page 7205 line 10 – extra ‘that’

10. How does each component of your results compare with previous climate impact runoff studies from around the globe?

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