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Hydrology and Earth System Sciences Discussions

Interactive comment on "

Quantifying uncertainty in the impacts of climate change on river discharge in sub-catchments of the River Yangtze and Yellow Basins, China" *by* H. Xu et al.

H. Xu et al.

xuhm@cma.gov.cn

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We greatly appreciate the editors and two anonymous reviewers' valuable interactive comments on our manuscript in Hydrology & Earth System Science Discussions. Our response to the comments is given below in sequence.

Anonymous Referee #1:

1. What is the "uncertainty" in this study? How to define uncertainty? The definition should be given in the context;

=> We appreciate the importance of stating precisely the nature of the modeling uncertainty that is being quantified. Uncertainty can derive from model input, parameters and model structure (Krysanova et al., 2007; Preston and Jones, 2008). In this study, we focus on uncertainty in climate projections from GCMs and state clearly in the Abstract (p. 6824, lines 6 to 9) and in the Introduction (p. 6827, lines 18 to 22) that it is uncertainty associated with GCM structure (i.e. choice of GCM), atmospheric emissions, and prescribed increases in global mean air temperature that is estimated. Abstract: "Specifically we quantify uncertainty associated with GCM structure from a subset of CMIP3 AR4 GCMs (HadCM3, HadGEM1, CCSM3.0, IPSL, ECHAM5, CSIRO, CGCM3.1), SRES emissions scenarios (A1B, A2, B1, B2) and prescribed increases in global mean air temperature (1°C to 6°C)". Introduction: "We quantify uncertainty in projections of climate change on river discharge by applying a range of climate scenarios using different GCMs (subset of IPCC 20 AR4 GCMs), emission scenarios (SRES A1B, A2, B1, B2) and prescribed increases in global mean air temperature (1 to 6°C), including the 2°C threshold of "dangerous" climate change (Todd et al., 2010)."

2. For any section, authors should describe where the uncertainty is resulted from? How much the uncertainty is? The paper gives one an impression: different models or methods give different result, the difference is the uncertainty. It is true, but more concrete definition and conclusion should be given;

=> We appreciate the referee's comments here. For clarity in the Results and Discussion, we separate our discussion of uncertainty into different sections associated with particular sources of uncertainty. For example, section 4.1 describes estimated uncertainty associated with prescribed increases in global mean air temperature whereas section 4.2 discusses uncertainty associated with different SRES emission scenarios. In each section, we also describe the projected changes in input variable such as precipitation before discussing the results of hydrological modeling to aid in understanding

the origin of differences in hydrological projections. The referee notes correctly that different GCMS provide different results. Indeed, we show that the greatest source of uncertainty in the projection lies in the choice of the applied GCM. One important consequence of this analysis for adaptation is our finding that uncertainty in projections of mean annual flows is less than that calculated for extreme (Q05, Q95) flows.

3. For any section, more clear conclusion should be summarized and should be more understandable for readers;

=> We appreciate this suggestion and will clarify the outcomes of our analyses in a revised manuscript.

4. Names of the Yangtze River and Yellow River are very common for scientists and public. They should be used other than the River Yangtze and River Yellow, etc.

=> For consistency in referring to water bodies across the globe, it is common practice to state the water body in advance of the given name whatever the local practice. We hope that adherence to this convention does not lead to confusion among readers.

References

Krysanova , V., Hattermann, F., and Wechsung, F.: Implications of complexity and uncertainty for integrated modeling and impact assessment in river basins, Environ. Modell. Softw., 22:701-709, 2007. Preston, B. L., Jones, R. N.: Evaluating sources of uncertainty in Australian runoff projections, Adv. Water Resour., 31:758-775, 2008.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 6823, 2010.