Interactive comment on "Climate change and its impacts on river discharge in two climate regions in China" *by* H. Xu and Y. Luo

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J. Ngaina (Referee) General comments: The study has assessed the impacts of climate change on river discharge in two catchments representing different climate regions in China using downscaled multiple (7) Global Climate Models (GCMs) applied to semi-distributed hydrological models Soil Water Assessment Tools (SWAT). The study has stated the problem, methodology and results clearly to support its conclusion. The study gives valuable insights towards understanding the impacts of climate change on river discharge in different climate regions. To further improve the readability of the paper, the authors should consider breaking most of the sentences that are very long to into multiple sentences and also recheck grammatical errors resulting from slight

omissions. Response: We really appreciate your comments and supports about our manuscript. We definitely would like to reorganize the long sentences to multiple sentences and recheck grammatical errors in revised manuscript.

Specific comments: The current paper has assessed the uncertainty in projected discharge for three time periods (2020s, 2050s and 2080s) using seven equally weighted GCMs for the SRES A1B scenario. However, understanding on climate change has increased especially with regards to emission scenarios such as the Representative Concentration Pathways (RCPs). Further, the study has used the CMIP3 datasets against the updated CMIP5 datasets which are currently available (released in 2013) and contains more models and advanced than CMIP3 datasets. Therefore, it would be critical for authors to clearly state the criteria used to select the climate scenario (i.e. the A1B SRES scenario) and datasets used in the study. However, the results presented and assessment of uncertainty based on SRES scenario and CMIP3 datasets would not be much different even if the RCP scenarios and CMIP5 datasets were used. Although the study has utilized ClimGen as a downscaling tool, dynamical downscaling would have been ideal for this study. The conclusion has been made based using output from the multi-ensemble models. However, it would have been great to know results based on an ensemble of the 7 models. Response: Many thanks for the specific comments about emission scenarios selected and datasets used in this study. We have assessed the uncertainties associated with GCM structure, SRES emissions scenarios, and prescribed increases in global mean air temperature in previous published paper. The key finding from that paper was that the single, greatest source of uncertainty in hydrological projections derives from the range of climate projections generated by GCMs deliberately to cover the full breadth of possible projections of future climate. The same as we response to Anonymous Referee #1, SRES scenario are based on assumptions about driving forces such as patterns of economic and population growth, technology development, and other factors. They assist in climate change analysis, including climate modelling and the assessment of impacts, adaptation, and mitigation. The RCPs are not a complete package of socioeconomic, emissions, and climate pro-

jections. They are consistent sets of projections of only the components of radiative forcing that are meant to serve as input for climate modelling. SRES A1B was widely used in climate change analysis and decision making in China. In this manuscript, we emphasis the heterogeneity of climate change and its impacts on annual and seasonal discharge, and the difference between mean flow and extreme flow in different climate regions in China. We also quantify the uncertainty caused by GCMs for near-term (2020s), medium-term (2050s) and long-term (2080s) using seven equally weighted GCMs for the SRES A1B scenario. We think it is of utmost importance and relative to successful water management and climate change adaption in different catchments in China. We would like to clearly state the criteria used to select the climate scenario and datasets used in the study in the revised manuscript according the reason mentioned above.

We have already quantified the uncertainty of climate change on river discharge for more catchments in China under RCP scenarios and CMIP5 datasets recently. Basically, the finding almost like the your deduction that there are no substantial difference in results about uncertainty based on under the RCP scenarios and CMIP5 datasets comparing with that presented and assessment in this manuscript.

Considering the downscaling method, we didn't get sufficient climate projections based dynamic downscaling method forcing by multi-GCMs for the simulation in our manuscript. Fortunately, we are excited to know that more climate projections are available recently from CORDEX (A COordinated Regional climate Downscaling EXperiment) by dynamic downscaling method. We would like use the climate projection based on dynamical downscaling in our future research.

For the presented results, we would like to show the results based on an ensemble of the 7 models in addition to separated simulation based on multi-models in the revised manuscript.

Technical corrections Line 7, (page 7100): "We assessed" should be changed to "The

study assessed". The use of "we" should also be adjusted throughout the manuscript e.g. Line 14 (page 7100), Line 11 (page 7102), Line 18 (page 7103) etc. Line 14, (page 7100): " -29 to 139 " should be changed to "-29 to 139 %" Line 21 to Line 25, (page 7101): Provide references to the cited work. References should also provided to all cited literature in the manuscript e.g Line 4 to line 10, (page 7102 that starts with "In a previous study"), Line 6 (page 7103, which starts with "The River Xiangxi lies") etc. Line 25, (Page 7104): The sentence " ... used in this study seven GCMs were from ..." should be rewritten for clarity e.g. " ... used in this study utilized seven GCMs from ... " Line 1, (Section 5, conclusion): "assesse" should be changed to "assessed" Response: Many thank for the detailed corrections. We would like correct the first one according suggestion.