Hoang et al. Mekong River flow and hydrological extremes under climate change

Authors' responses to comments

By Long Phi Hoang

long.hoang@wur.nl

Responses to Editor's comments

We highly appreciate the editor's effort in handling the review process for our manuscript!

Comment: As suggested by the reviewers and reviewed by myself, I would like to say the revised manuscript improves significantly. However, still some concerns raised. I suggest the authors further revise the manuscript according to the new comments.

Response: We have addressed all reviewers' comments and revised the manuscript accordingly. We describe our responses and changes below.

Responses to Reviewer#1 comments

We highly appreciate Reviewer#1 for his/her dedicated reviews and constructive comments. We have addressed all comments and revised the manuscript accordingly, as described below.

Comment: I believe that the authors have addressed most of my comments adequately. My only remain comment is rather editorial regarding Fig 1, which the authors edited with country boundaries of rather low quality.

Response: We now use the country boundaries map with higher quality and updated Figure 1 accordingly.

Revised Figure 1:

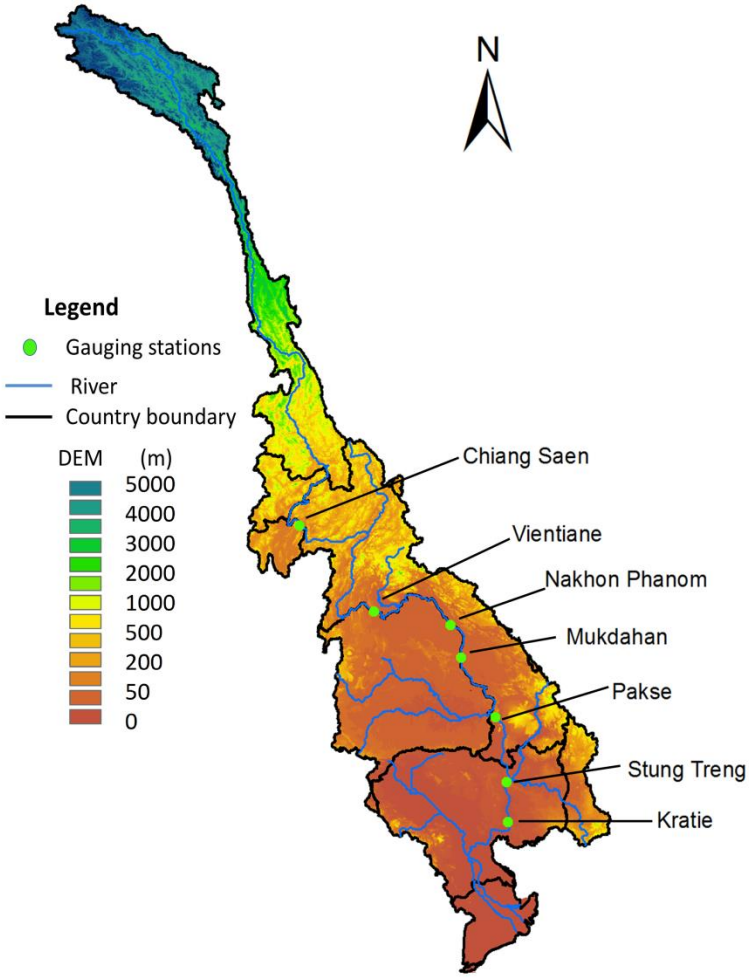

Figure 1. The Mekong River basin's elevation map and locations of mainstream gauging stations

Responses to Reviewer#3 comments

We highly appreciate Reviewer#3 for his/her dedicated reviews and constructive comments. We have revised the manuscript following the comments and suggestions, as described below.

Comment#1: P4, L18-20, beside the two modelling cases cited by authors, some Asian researchers published Mekong modelling paper that also have same conclusion. Some recently papers should be cited, such as "Wei Wang et al. Modelling Hydrologic Processes in the Mekong River Basin Using a Distributed Model Driven by Satellite Precipitation and Rain Gauge Observations, Plos One, 2016"

Response: We have added citation to the suggested paper to the revised manuscript.

Revised text: *Several previous studies also reported lower modelling skill in the upstream stations (e.g. Chiang Saen) compared to the downstream stations (Kingston et al., 2011; Lauri et al., 2012; Wang et al., 2016).*

Comment#2: P10 L6, why selecting (2036-2065) as the future period, not the first three decades (2010-2039) of 21st, nor the last three decades (2070-2099)?

Response: We selected the 2036-2065 period to represent climatic condition by the mid-21st century. This timeframe if often used, for example, by the Mekong River Commission, for long-term water resources planning and climate change adaptation (MRC, 2011a). This study's scenario definition is therefore relevant for policy and management in the basin. We have added this explanation to the revised manuscript.

Added text: *We used the most recent CMIP5 climate projection to develop climate change scenarios. The scenarios were developed for the 2036-2065 period, i.e. mid-21st century, which is a relevant timeframe for long-term water resources planning and adaptation (MRC, 2011a).*

Comment#3: P13 L14-15, It is well known that APHRODITE performs poor in mountainous regions. However, APHRODITE used the rain gauge data in China which located in the upstream of Chiang Saen, while there almost no rain gauge data merged into APHRODITE in the mountainous region in Laos which located in the downstream of Chiang Saen. So, authors should not simply attribute the low skill to the mountain region. Some more comprehensive explanations are needed.

Response: We agree with Reviewer#3 that the mountainous topography is not the only reason for low model skill at Chiang Saen. Based on previous studies (e.g. Adamson, 2001; Lauri et al., 2012 and Räsänen et al., 2012), we attribute this low skill to (1) regulation impacts of upstream dams and (2) possible inaccuracies in the APHRODITE data. Following Reviewer#3's suggestion, we have also added more comprehensive explanations about the possible effects of topography and low density of rain gauges on rainfall data quality.

Added text: *Lower accuracy of the APHRODITE precipitation data above Chiang Saen could also affect the model's performance. Rainfall data quality is probably affected by strong orographic effects and by a relatively low rain gauge density in this area (Lauri et al., 2014).*

References

Adamson, P.T.: Hydrological perspectives on the Lower Mekong Basin: The potential impacts of hydropower developments in Yunnan on the downstream flow regime. Int. Water Power Dam Constr. March 2001, 16–21, 2001.

Lauri, H., Moel, H. D., Ward, P. J., Räsänen, T. A., Keskinen, M., & Kummu, M.: Future changes in Mekong River hydrology: impact of climate change and reservoir operation on discharge. Hydrology and Earth System Sciences, 16(12), 4603-4619, 2012.

Lauri, H., Räsänen, T.A., Kummu, M.: Using Reanalysis and Remotely Sensed Temperature and Precipitation Data for Hydrological Modeling in Monsoon Climate: Mekong River Case Study. Journal of Hydrometeorology 15 (4):1532-1545. doi:10.1175/jhm-d-13-084.1, 2014.

MRC: Assessment of Basin-wide Development Scenarios: Main Report - Basin Development Plan Programme. Mekong River Commission, Vientiane, Lao PDR, 2011a.

Räsänen, T.A., Koponen, J., Lauri, H. and Kummu, M.: Downstream hydrological impacts of hydropower development in the Upper Mekong Basin. Water Resources Management, 26(12), pp.3495-3513, 2012.

Wang, W., Lu, H., Yang, D., Sothea, K., Jiao, Y., Gao, B., Peng, X.; Pang, Z.: Modelling Hydrologic Processes in the Mekong River Basin Using a Distributed Model Driven by Satellite Precipitation and Rain Gauge Observations. PloS one, 11(3), 2016.