Dear Reviewer

We would like to express our gratitude for dedicating time to review our manuscript, titled "A high-resolution perspective of extreme rainfall and river flow under extreme climate change in Southeast Asia" and for providing valuable feedback. Your insightful comments and suggestions for improvement have been greatly appreciated. Furthermore, in response to your comments, we have carefully revised the manuscript to address the concerns raised. We address your comment point by point in the table below, **P** refers to page and **L** refers to line number in the track-change version, e.g., **P1L9** means page 1 line 9.

Comment 1.

The message conveyed in the introduction is not clear enough. In particular, the science question is well described, which however is not connected to the motivation very well. Based on my reading, it seems that the motivation is to use CMIP6, as a successor of CMIP5 and CORDEX-SEA, to investigate the impact of climate change, although this science question has been addressed previously and extensively. This gives me the impression that this study is a modeling study instead, in which I am expecting to see more analysis on the improved performance of CMIP6 over its predecessors. I suggest the authors either think about adding new experiments (maybe in specific regions) to compare the results of using different climate forcing, or elaborate the motivation in a more clarified and concise way.

Response 1.

We acknowledge the reviewer's concern regarding the message in the introduction. After receiving feedback from the reviewer, we realize that paragraph 5 may mislead readers about the objective of the study. The focus of our study is to investigate the impact of climate change on streamflow, rather than to compare the performance between HighResMIP and CORDEX-SEA. In response to this comment, we have removed paragraph 5. We have also elaborated some references to the next paragraph (P3-4L87-101).

Comment 2.

There lacks a validation on the hydrological simulations. I understand that the model was previously validated in the same regions. Are those simulations using the same forcing as your study? It would be helpful to clarify this, as the hydrological simulation depends significantly on the atmospheric forcing being used.

Response 2.

The simulation for the validation in the previous study used different forcing compared to those employed in this study. We have added an explanation about the forcing that is used for the simulation in the validation, "Sutanudjaja et al. (2018) validated the PCR-GLOBWB 2.0 simulation with streamflow data from the Global Runoff Data Centre (GRDC). The forcing data set for the simulation is based on time series of monthly precipitation, temperature, and reference evaporation from the CRU TS 3.2 (Harris et al., 2014) downscaled to daily values with ERA40 (1958–1978) (Uppala et al., 2005) and ERA-Interim (1979–2015) (Dee et al., 2011)" (P6L172-175).

<u>Comment 3.</u>

In the discussion (especially in the section 4.1), I appreciate the authors' thorough analysis against other available studies in the same region. When making comparison, it may be even better to explain what factors may cause the difference between your results and others'. What are the relevant uncertainties? There is a separate section on the sources of uncertainty. But that is more like a general discussion.

<u>Response 3.</u>

There are two differences between HighResMIP used in this study and the CORDEX-SEA employed in the previous study by the CORDEX group. Firstly, HighResMIP is based on the CMIP6 version, whereas CORDEX-SEA is based on CMIP5. Secondly, HighResMIP is globally run at a high resolution, whereas CORDEX-SEA is derived from downscaling results from CMIP5, and thus a more indirect product. Previous studies have indicated that HighResMIP simulation shows better performance than CORDEX-SEA simulation. To address the reviewer's comment, we have added this information in P13L397-405.

<u>Comment 4.</u>

Figures need reorganization.

NO	Comment	Response
1	*Specially, in figure 1, are there statistical quantities (in addition to whisker plot) that you can use to better demonstrate the improvement from the bias correction?*	*We have added additional information about the statistical index in the caption. The information is "Distance value (D) on the vertical axis shows the distance between the cumulative distribution of the observation and the model".*
2	*In the second column of figure 2, the range of color maps need to be adjusted to improve readability.*	*We have revised the legend.*
3	*Some figures relevant to the discussion (such as those in section 4.3) need to be moved from the supplement to the main context*	*The analysis of recession constant in section 4.3 is used as supplementary support for the finding in the result section. While integral to the overall study, it does not constitute the main goal of the study, therefore we keep the figure in the supplementary material.*
4	*Line 297, It is more appropriate to either move the figures relevant to the discussion here or move the discussion to*	*Thanks for the suggestion. We have moved the figure of SDII in*

	supplement.	*the main manuscript (Figure 4)*
5	*In section 2.1, a map with some texts showing geographic regions is recommended.*	*Thanks for the suggestion. We have added figure of the Southeast Asia Domain in figure 1.*

Minor comments

No	Minor comment	Response
1	Section 2.2.1, when describing the difference among climate data (e.g., CORDEX-SEA and HighResMIP), it may be good to mention their corresponding resolution.	We have added the resolution information in P5L131-132
2	"historically forced atmosphere run of HighResMIP (HighResSST), the Hist-1950" What is the difference? A bit more elaboration is helpful.	The HighResSST is the HighResMIP experiment with prescribed SST, whereas the Hist-1950 is the HIghResMIP experiment with atmosphere-ocean couple model. We have added this information in P5L136-138
3	Line 125, "high skill" is weird wording and is not accurate.	We have removed "*high*"
4	Line 131, It is actually possible for GCMs to simulate at high resolutions. So it may be good to delete "what is possible".	We have removed "*what is possible*" (P5L147)
5	Line 148, "The model runs in 5 arcmins spatial resolution, which is about 10 km by 10 km at the equator." This does not seem to be a high resolution for GHMs as claimed early in this paragraph.	The global hydrological model (GHM) simulates distributed hydrological responses to climate and weather variations at a higher resolution than in general circulation models (GCMs). In addition, for a global hydrological model 5 arcmins spatial resolution is relatively high resolution. To clarify this we address this comment with removing "what is possible" (the same with

		previous comment P5L147)
6	Line 150, What remapping method do you use?	We used the First-order conservative remapping method. We have added the information in P6L165.
7	Line 168-173, This paragraph is not necessary. Or you may want to move it upper	We have removed this paragraph
8	Line 200, "DJF". This is defined later in page 10.	We have added the definition (P7L218-219)
9	Line 222, "is" -> does	We have changed *"is"* to *"does"* (P8L241)
10	Line 247, How is the probability calculated? Section 2.3.3 "The probability change is calculated based on the change of the number of extreme low and extreme high events in the future compared to the historical"	We have added the information about how the probability calculated in P9L268-269. *"The probability change is calculated based on the change of the number of events that exceeded extreme low and extreme high reference values in the future compared to the historical."*
11	Line 256, Please rewrite this sentence to improve clarity.	We have rewritten it to "Acknowledging uncertainties, where extreme values from certain models are included in the averaging process, a trend significance test was also performed. This test is grounded in model agreement and remains unaffected by extreme values, as they are excluded 280 from the trend analysis." (P9L277-280)
12	Line 321, This explanation is unnecessary for the readers of HESS.	We have removed it
13	Line 323, The change of probability can be up to 200%? Same question for figure 4-6. It is useful to define how the probability is calculated more clearly in the methodology section.	We have added the information about how the probability calculated in P9L268-269. *"The probability change is calculated based on the change of the*

		number of events that exceeded extreme low and extreme high reference value in the future compared to the historical". For example, if the occurrence of future extreme is doubled than the historical period, then the probability increase is 100%.

We sincerely appreciate your thorough review of our manuscript and the constructive feedback provided. We believe that the revisions have significantly enhanced the manuscript's quality, scientific rigor, and relevance. We are confident that these improvements position our study as a valuable contribution to the field of hydrology and climate change research.

Thank you for considering our revised manuscript for publication in HESS journal.

Sincerely,

Mugni H Hariadi

Corresponding author