

## ***Interactive comment on “Attributing the 2017 Bangladesh floods from meteorological and hydrological perspectives” by S. Philip et al.***

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RC2: Cause of the severe floods and their occurrence tendency in relation to climate change are very important topic in Asia, and quantitative assessments within-situ data analysis with model verifications are expected. This study focused in the severe flood in 2017, and counterbalances of precipitation and discharge for the long-term return periods of floods are discussed based on observation data and multiple model output. I admire the author's challenges with many works, however, I could not capture (understand) the fundamental objectives and clear results from the paper. As presented in the title, “attribution” and “perspective” mislead the readers to know the target of the paper. I would like to suggest fundamental revisions of the paper.

C1

AC2: In this paper we perform an attribution analysis starting with precipitation as well as discharge. We think the reviewer interpreted the word ‘perspectives’ in a different way than we meant it to be. We changed this to ‘standpoints’, assuming that the title is now more clearly related to the content of the paper.

– RC2: Major comments 1) Ambiguous objectives and results Major objectives may be indicated in paragraphs at P4L25 (or P26L14), such as not only the precipitation variability but ability of discharge needs to be considered for estimating return period of floods. However, there are no explanations about the physical mechanism (perspective?) of extreme precipitation/discharge variability to cause flood events in Bangladesh based on hydro-climatological point of view with references. Regarding to the long term changes of the ability of discharge in such a large scale watershed, they would be strongly related to changing of river sediments, micro-topography affected by previous floods, artificial settlements such as bridges or bank, or expansion of residences due to population increase. I could not understand how the long-term trends or probability for return periods of precipitation/discharge could link to an extreme event without assessments to cause flood in 2017 as a case study. Many considerations are discussed, however, clear results are not show, such as “trends are not significant (P1, L7;P26L19)”, “values are less uncertain,(P1L12;L26L28)”, “cancellation between A&B (P26L21)”, etc.

AC2: As stated above, the title may be misinterpreted, and we changed it now.

We understand the concern of the reviewer about river sediment etc. and the inability of the climate models to represent this. In the discussion we do mention that water level is not one-to-one related to either precipitation or discharge. Besides, ongoing morphological changes will influence the flooding. We note this and emphasize that an attribution of the flood in terms of flooded area or affected people is not (yet) possible, however, the use of multiple methods and multiple variables in the attribution of extreme events allows for a robust estimate of changing flood hazards under climate change.

C2

In the current work we differentiate between climate change influencing floodings, which we can study with the models used in this paper, and other factors like morphological changes that we cannot attribute to climate change. An attribution study including these additional changes is not (yet) possible.

In this paper we performed an attribution analysis for the flooding in Bangladesh in 2017 using methods currently available. The reviewer is concerned about the (lack of) clarity in our conclusions. There are several possible answers to the attribution question in general, all of which give useful information. These possible answers include i) the event was made more likely due to anthropogenic climate change, ii) the event was made less likely due to anthropogenic climate change, iii) anthropogenic climate change did not alter the frequency of occurrence of the event and iv) with our current understanding and tools we cannot assess whether and how the event was influenced by anthropogenic climate change. Our conclusions, including information about significance and uncertainties, do therefore give a useful answer to the attribution question. Besides, we compare two ways to look at the attribution question on the flooding event; starting with precipitation and starting with discharge.

– RC2: 2) Descriptions of chapters are like reports, not as in article. This study prepared several kinds of observation or model based data, and analyzed long-term probability. Do you want to compare something or ensemble to produce better predictions? Forecast map of Aug. 2017 was already shown in Fig. 1, but what is the problem for this prediction? In the Section 3, observation of water level was additionally analyzed, but why the analysis of discharge is not enough? Usually, discharge is calculated based on water level, and there is not discussion of water level in the section of “Model analysis”. In many parts, the authors described all the matter of what they did as reports, but reader can not capture reasons and corresponding results based on logical explanation.

AC2: We are not trying improve the forecast of the 2017 event or increase predictability. Instead we are looking to quantify (1) how the risk of this event occurring has been

C3

altered by climate change (by comparing to pre-industrial) and (2) how the risk of this sort of event is likely to change in future (by comparing to 1.5 and 2 degree future ensembles).

– RC2: 3) Many careless parts for reader. Explanations are insufficient and cannot understand the explanations in many parts. I would like to ask brush up the paper again, such as; > Where is a green circle, Brahmaputra, too small words in Fig.1

AC2: As stated clearly in the figure caption both of these panels are reproductions of figures produced by a 3rd party and as such we are unable to edit these. The links to the original documents are provided where the reader can enlarge the figure reproduced. The green circle is clearly visible along the Brahmaputra river at the NW of the map shown. We added that the green circle is in the northwest of the map.

– RC2: What is the “attribution methods” at P4L30?

AC2: we will change the sentence to: To compare the differences between the attribution results for the two variables...

– RC2: What the scale of “past, present future” stand for ? (P4L33).

AC2: We have qualified in the text the scale of past, present and future here.

– RC2: You use CPC data “for what?”, P5L17.

AC2: We added a sentence at the beginning of section 2, emphasizing that the use of the data is explained below: The explanation of how the datasets are used is detailed in Sect.2.3.

– RC2: What is the “same analysis” at P6L8?

RC2: As stated the same analysis was performed on the model results as was performed on the observations. We will add that this analysis will be explained in Section 2.3.

C4

– RC2: Confusion of the study order exists, such as in 2.2.1, such that Use 3 experiments Transient experiment Two time slice experiments Large ensembles are created First set of experiments" ,A second climatology"A third ensample" ,The second set of experiments A third set of experiments",

AC2: We agree that this is confusing and have amended the text for clarity.

– RC2: "several river discharge simulations" at P8L28, corresponds to "five different model experiments or several different setting in the same model? Or, simulations at several rivers?"

AC2: we explain the simulations in the sentences that follow this statement. We will add 'as explained hereafter'.

– RC2: Several "figures are shown without explanation, such as Fig.3b, Fig.5a, etc.

AC2: Fig3b is described, we apologize for mixing up the order of description in the caption and corrected that. We checked that Fig.5a already has an explanation. We could not find any other panels without explanation.

– RC2: "Large uncertainty in the accuracy of data " at L6P13, how you detect them and why you used them? > Etc..

AC2: We discuss this in the discussion section. It is known that observational datasets do have uncertainties. We have to use the best data we have.

In general, we think that we explain the uncertainties from using different observations, different variables, different models, different methods etc. well enough. We emphasize that despite these uncertainties and differences, our analysis, in which we combine a multi-method attribution analysis of the meteorological drivers with a multi-model approach in hydrological modelling, allows for a robust estimate of changing flood hazards under climate change.

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