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Discussions

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

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–RC1: Dear Editor, The submitted manuscript entitled "Attributing the 2017 Bangladesh floods from meteorological and hydrological perspectives" is a well written and structured paper. They have analyzed 10-day precipitation index for extreme events in August as well as river discharge over Brahmaputra basin. I have a few comments for improving the paper:

It is unclear why 10-day average precipitation is considered where the 1-day or 5-day maximum precipitation are well known as flood index.

AC1: The Brahmaputra basin feeds the rivers in Bangladesh. The basin is so large that using only 1-day or 5-day precipitation would not take the precipitation into account that

falls further upstream in the basin. We take a 10-day average to represent the area that collected water that arrives at Bahadurabad and contributed to the flooding. Using 1-day or 5-days over the whole basin would exclude the additional water from region of the Brahmaputra basin in the Northeast of India that reaches Bahadurabad at the same time as precipitation that falls later in the region closer to Bahadurabad.

We know that averaging over such a large basin and time scale is not the most ideal situation. This is why we compared the results to the analysis results from discharge.

– RC1: Please explain the role of temperature in precipitation change. Based on the ground observations, can you explore a relationship between them over the study area? I have a concern about the validity of scaling the GEV parameters (location and scale) similar to Clausius-Clapeyron (CC) relationship in the context of urban climate. The observed global mean surface temperature (GMST) is a feature confined to the boundary layer, whereas, precipitation is formed in clouds that develop in the free atmosphere up to a height of several kilometres, so it is unlikely that the surface temperature has some effects on precipitation in terms of the CC relationship. I would therefore recommend making the physical meaning of this scaling clearer.

AC1: The scaling is taken to be an exponential function of the smoothed global mean temperature, This exponential dependence can clearly be seen in the scaling of daily precipitation extremes with local daily temperature in regions with enough moisture availability (Allen and Ingram 2002; Lenderink and van Meijgaard 2008). It is also expected on theoretical grounds through the first-order dependence of the maximum moisture content on temperature in the Clausius-Clapeyron relations of about 7%/K, which gives rise to an exponential form. Note that we fit the strength of the connection, which is often different from CC scaling. As it is not clear what the relevant local temperature is, but local temperature usually scales linearly with the global mean temperature, we chose the latter.

We will add this as a paragraph in the manuscript.

– RC1: Moreover, it is not clear the CC relationship exhibited by 10-daily extremes in your study area linked with convective nature of precipitation.

AC1: As we state above, we fit the data using a GEV with scaling to GMST. Comparing the observations to the fit line, we see no evidence that our assumptions are incorrect.

– RC1: Add some details into the Statistical methods for trend detection. Time series of parameters are may be autocorrelated (temporal dependency over times scales of several years). I am wondering whether the authors took these autocorrelations into account or not.

AC1: We checked the autocorrelation and found that there is no autocorrelation of the July-September maximum of 10-day mean precipitation, which is the measure we use in this study. (And for single days the autocorrelation becomes negligible within 4 days.) See Fig. 1. Therefore, we will add in the Statistical methods section for trend detection: We checked that year-on-year autocorrelations of RX10day are negligible, so serial autocorrelations are not a problem in this analysis.

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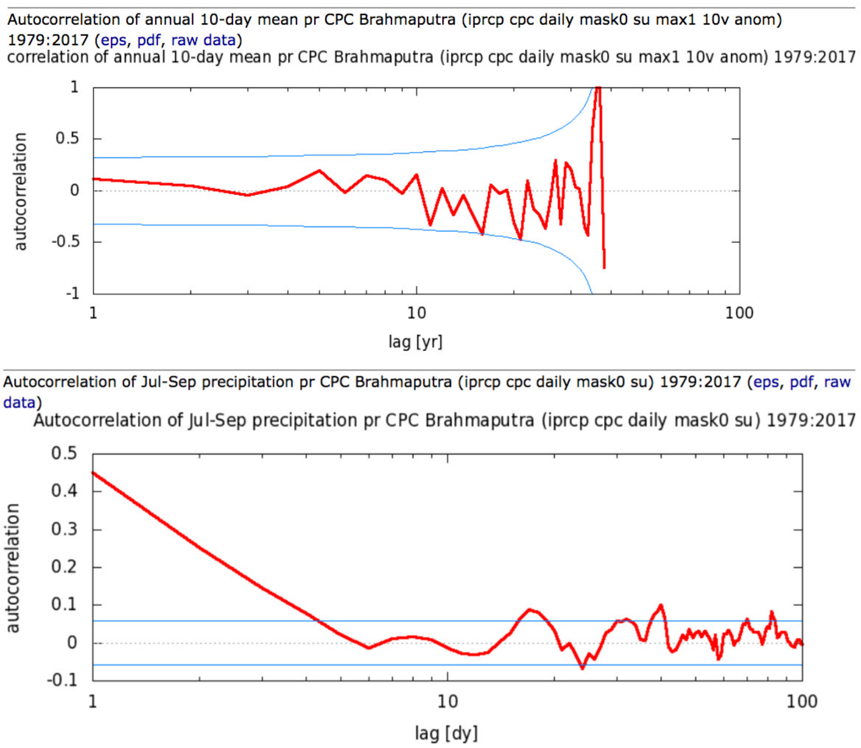

Fig. 1.