THE UNIVERSITY OF ARIZONA.
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Dear Editor:

Please consider this additional response to the comment from Reviewer 1.

In extreme value theory, recurrence intervals are calculated for independent events, either deriving annual maxima or through the peak over threshold approach. In both cases, a time series of a variable observed at a location or a basin is used. In the paper under review, the computation of the recurrence interval accounts for all events observed in all basins of the same drainage area. Assuming that we have N basins with the same area (e.g. 64 km2) included in the Upper and Lower CRBs, this implies that the recurrence interval is calculated by pooling together N time series of a variable. Through this method, the authors could present discharge values for the 500-year return period, using 10 years of rainfall records.
However, since storms may have happened at the same time in contiguous basins, the events may not be statistically independent, as they are originated from the same weather pattern. In other words, increasing the sample size with records of contiguous basins is not a trivial operation, which requires careful evaluation. This may contradict the principle of extreme value theory. Addressing this issue is crucial to build FMA curves and the authors have not provided any justification.

Additional response to reviewer comment above) It should also be noted, that complete statistical independence does not occur in nature. Hydrologic events have finite autocorrelation in time (e.g. ENSO and other climate cycles). Also, we do not see how correlation in space of rainfall necessarily negates our approach. Our approach assumes that the many subbasins within a hydroclimatic region can be used as space-for-time substitutes. That is, one can aggregate 100 subbasins with 10 years of data (as an example) to create a dataset with effectively 1000 years of data. Any particular drainage basin in unlikely to have experienced a 100 or 500 year event in 10 years but some small fraction of them will likely have. It seems reasonable to us that, if a rainfall event of a given intensity impacts a larger region (more subbasins), it should be weighed more heavily in the analysis compared to an event of the same intensity that impacts a smaller area. The argument of the reviewer appears to be that any event that crosses multiple basins cannot be considered. This may be the correct interpretation of extreme value theory but it does not seem true at a practical level.

Thank you,

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