Discussions and Closures

Closure to “Coincidence Risk Analysis of Floods Using Multivariate Copulas: Case Study of Jinsha River and Min River, China” by Yang Peng, Yulong Shi, Hongxiang Yan, Kai Chen, and Jipeng Zhang

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We would like to thank the discusser for his comments on the coincidence flood risk modeling in Jinsha River and Min River, China. The discusser’s comment brings focus to the discussion of extreme-value selection methodology and historical flood information. In flood risk analysis, we acknowledge that there is always an alternative modeling approach that could be used to generate desired prediction results. In this comment, the discusser made two valuable points regarding the original paper, and our responses are provided in the following two paragraphs.

Although we used daily annual maximum (AM) flood occurrence dates in the multivariate copula modeling, we focused on the coincidence probability of flood occurrence dates in a period (e.g., June 1 to October 31) rather than highlighting the coincidence probability on a single day. Any water resources management suggestion drawn from the original paper was based on the accumulation coincidence probability in a period. Also, in addition to the AM data, we also used the monthly maximum (MM) data, which showed strong coincidence to confirm our conclusion. Similar results were obtained in the original paper no matter whether daily AM or MM data were used. Therefore, it is expected that similar results will be found if we use 2- or 5-day sum AM data. We acknowledge that peak-over-threshold is an alternative approach to block maxima, which can increase the sample size in the modeling. This approach, however, suffers from several drawbacks such as the subjective threshold selection and temporal dependence of peaks that requires an additional declustering step (Cooley et al. 2007).

Reducing model uncertainty was our motivation to look for any available, documented historical flood information in the original paper. In our statistical modeling, historical floods substantially improved the marginal distribution estimations. Our empirical exceedance probabilities were estimated separately for historical and systematic records and they agreed very well with the fitted marginal distributions. We agree with the discusser that “information on the discharges in the missing years between historical and regular records may help reduce the uncertainty.” Unfortunately, our earliest historical flood information was dated back to the year 1637, in the Ming dynasty of China. To fill the missing year gap, extensive sources of historical archives need to be studied and a historian, rather than a hydrologist, would be better for this job. But if there exist written records or physical evidence to constrain historical flood intervals in the period of 1637–1950, one possible path forward is to use the “flow intervals and multiple perception thresholds” approach in Bulletin 17C, a recently updated US federal guideline for flood frequency analysis (England et al. 2019). We believe that such an approach will lead to improved predictions of coincidence flood risk modeling for this case study.

References

