Uncertainty analysis of flood control design under multiple floods

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Abstract

The conventional flood control design analysis usually focuses on a specific aspect like flood peak discharge or the volume of flood, with the development of technology, hydrological analysis tends to be multi-dimensions research. The multivariate frequency analysis of a flood has been widely investigated, while there is lack of literatures about flood control design under multiple floods. In this study, taking the Guiping Shipping Hub as a study case, a Copula-based approach is proposed to investigate the flood control design under multiple floods, comparison between the proposed method and conventional approach is investigated, the sampling uncertainty is analyzed. The results indicate that (1) the joint distribution of main and tributary floods is modeled by Clayton Copula with PE3 as the best-fit marginal distributions. The proposed Flood Control return period (FC-RP) can describe the different role of main and tributary floods in flood control design. (2) flood combinations uncertainty analysis indicates that the uncertainty of the joint design combinations under the effect of multiple floods decreases with the increase of sample size n, but increases with the increase of the design return period. (3) the 95% confidence interval and standard deviation of the design value of flood control design water level calculated by Flood Control RP is smaller than that of OR RP, which means the Flood Control RP can reduce the uncertainty of flood control design under the condition of multiple floods.

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