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Risk analysis of flood control reservoir operation considering multiple uncertainties

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Abstract:

During flood control reservoir operation, uncertainties occur in flood forecasting, hydrograph shape, streamflow simulation, reservoir storage, water level, and discharge outflow. It is therefore important to analyze flood control risk due to these uncertainties. This study proposes a stochastic simulation method, comprising a copula-based simulation method accounting for flood forecasting uncertainty, a copula-based single site daily streamflow simulation method for uncertainty in flood hydrograph, and the Latin hypercube sampling (LHS) method for uncertainty in storage, water level, and outflow discharge. Using the Three Gorges Reservoir (TGR) as a case study, the flood control risk, defined by traditional statistical and entropy methods, was calculated and compared. The proposed method satisfactorily preserved the statistical characteristics of the original streamflow series. Results from the TGR case study showed that the entropy method was effective for assessing flood risk due to different uncertainties. Thus, this study provides gives a comprehensive evaluation

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