



Accounting for reservoir management strategies in flood risk assessment

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Some reservoirs play a major role in flood protection, reducing the probability of peak discharges in the river downstream. However, flood risk downstream of major reservoirs should be carefully evaluated, since the flood protection capacity of the reservoir is reduced as the return period of the flood event increases. In these cases, dam operation during floods is a major concern, especially if a large population is at risk in downstream areas. Reservoir management strategies during floods effectively change the probability distribution of peak flows downstream of the dam, and should be accounted for in risk assessment studies. The quantification of how dams affect the PDF of peak outflows for a given distribution of hydrograph inflows is a difficult task, because it depends on the strategies followed for dam operation during floods. A framework for analysing the effect of reservoir management strategies in flood risk assessment studies is presented in this paper. The methodology is based on the analysis of the probability distribution of expected inflows for different return periods and durations. Monte Carlo simulations were performed to assess the effect of different dam operation strategies on the risk of dam overtopping and on the maximum discharge spilled to the river. The results show that probability distributions of maximum water level and maximum outflow show more sensitivity to operating strategies for high probabilities of exceedance than at the tail of the distribution. This sensitivity decreases as the return period of the flood increases. Furthermore, the relative success of different strategies is also a function of the return period. As a conclusion, a methodology for conducting flood risk assessment studies downstream of dams is presented.