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Dynamic Flood Control Water Level Control for the Three Gorges Reservoir

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The Three Gorges Reservoir (TGR), which is to date the largest multipurpose hydro-development project ever built in the world, is a vital project for water resources development of China's largest river, the Yangtze River. Its benefits include flood control, power generation and navigation improvement, however, a serious contradiction exists between flood control and power generation during the flood season.

A reservoir dynamic flood control water level (FCWL) control method was developed by using the proposed stochastic flood prevention risk operation (FPRO) model, based on the two-stage principle. The FPRO model has two constraints, one is that the flood prevention risk should be controlled within the real-time acceptable risk, and the other is that the water level in the end of operation period should be linked with the current FCWL in a stochastic form. Based on the FPRO model, the upper limits of dynamic FCWL can be determined through routing different design floods, in which the reservoir's FCWL can be controlled dynamically without increasing the flood risk both in statistical sense and in deriving different design floods. The TGR was chosen for the case study and the optimal results indicate that the FCWL can change dynamically in the condition of forecasting inflow. It is shown that the proposed model can greatly improve hydropower benefit and decrease flood risk simultaneously.