

THE CONCERTED FLOOD CONTROL OPERATION RULES AT THE UPPER AND LOWER JINHU RESERVOIRS

JIAN LIU¹, WEN XIAO² and JIANYUAN WANG³

¹PhD, PMP, Associate Professor, Member of ASCE, College of Architecture and Civil Engineering, Shenzhen University, Nanshan District, Shenzhen 518060, China;
(Tel: +86-755-2673-2825, Fax: +86-755-2653-4233, e-mail: liujian@szu.edu.cn)

²PhD, Director, Senior Engineer, Shenzhen Flood Control Administration Office,
No.4, Xingzhou Rd., Futian District, Shenzhen 518038, China;
(Tel: +86-755-8380-6699, e-mail: szxiaowen@vip.sina.com)

³Deputy Dean, Professor, College of Architecture and Civil Engineering,
Shenzhen University, Nanshan District, Shenzhen 518060, China;
(Tel/Fax: +86-755-2653-6130, e-mail: wangjy@szu.edu.cn)

The concerted flood control operation rules at the upper and lower Jinhu reservoirs on the Bijiasha River in Shenzhen, China were discussed in this study. The upper and lower Jinhu reservoirs play an important role in the flood control in Shenzhen City. The present staggering operation modes are the staggering operation worked out based on an empirical method of the multiple fixed discharges and water levels. There are the following shortcomings in the present modes. 1) The two reservoirs were operated separately during the flood period, and do not consider the effects of the concerted operations of the two reservoirs; 2) The upstream flood forecast information based on the rainfall forecast system and downstream hydrological information were not used; 3) The staggering operations need to determine the staggering discharges and choose the staggering water levels at the reservoirs which consider the inflowing floods having the same variation trend with the flood in the reach between the dams and the Nigang gaging station. However, the flood hydrographs upstream and downstream of the dams are actually different; 4) The staggering operations need to release the floodwater in the fixed discharges during the staggering period, and require large storage capacities because the river channel discharging capacity is not employed fully. Actually, the storage capacities of the upper and lower Jinhu reservoirs are relatively small; 5) The present operation modes consider only the design flood and check design flood, and do not take account of other potential floods; and 6) The real-time flood information that can be obtained in the river system is not considered.

In order to improve the reservoir operation modes, the concerted real-time operation rules for the two reservoirs were developed in consideration of the hydrological information of the inflows, and the water level of the downstream river channel. In the new operation rules, the releasing discharges from the two reservoirs were determined according to their regulating capacities, and the downstream water level in the channel from the dams to the Nigang gaging station where the real-time water level and discharge data are available. The uncertainty of the flood forecast and the downstream discharge forecast data is taken into account during the process of determining the releasing discharges. In actual operation, the floodgate opening are adjusted in a define time because of the floodgate mechanical performance. The influence of the downstream water level on the reservoir releases was also considered from the safety view of point. The improved

operation modes are planning to be executed from the flood season in 2005. The effects of the newly developed operation rules were verified by a 50-year flood. The calculated results shown in Fig. 1 and 2 indicate the reservoir water levels at the upper and lower Jinhu reservoirs by the new operation rules are lower than the ones by the present modes. In the new operation modes, a great amount of the flood water into the upper Jinhu reservoir are retained in the reservoir during the peak period and released after the flood passes away. The retention effects performed by the new operation rules are better than those by the present modes. The retention effects at the lower Jinhu reservoir do not have obvious difference because the similar operation modes are used for the reservoir. The new operation rules are operated easier than the present ones, and provide higher safety to the reservoirs and the downstream river channel.

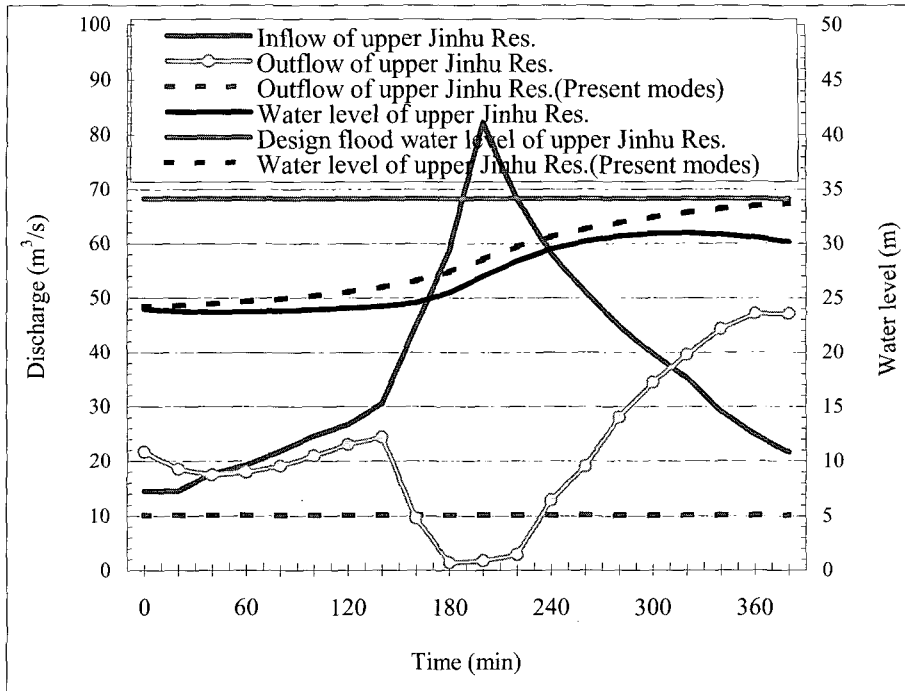


Fig. 1 Variation of the inflow and outflow at the upper Jinhu reservoir

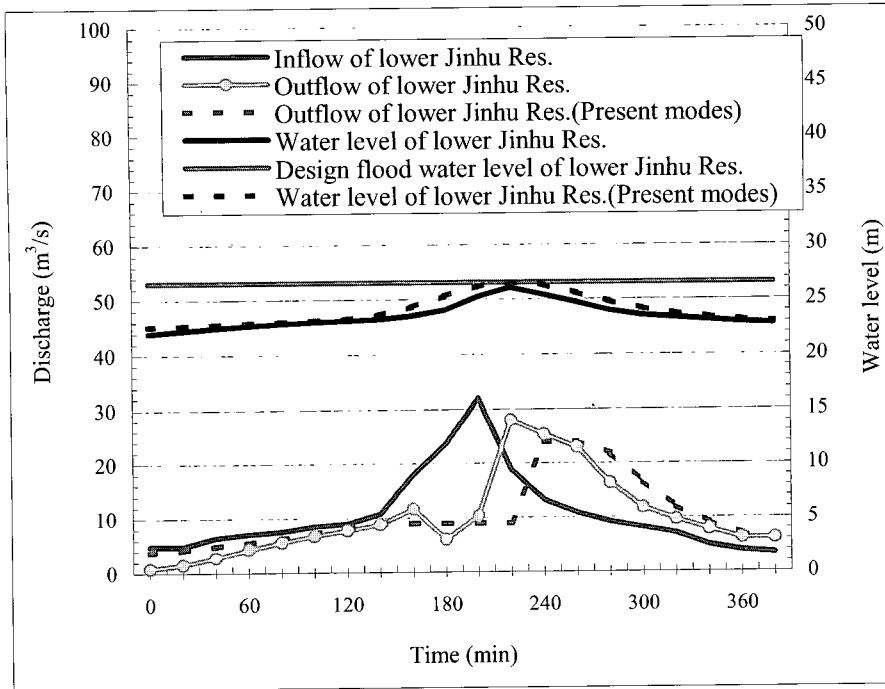


Fig. 2 Variation of the inflow and outflow at the lower Jinhu reservoir