

Study on optimal allocation mechanism of near natural ecological water replenishment

Peng Dou, Yadong Zhou

(Beijing Water Science and Technology Institute, Beijing 100048, China)

Abstract

Combining the characteristics of urban rivers and lakes with the water replenishment needs, this article proposed the scientific connotation and goals of near-natural ecological water replenishment based on the previous ecological water delivery, determined the key index system affecting the ecological environment of urban rivers and lakes, established a technical framework for near-natural ecological water replenishment, and elaborated on the engineering measures, evaluation index system, operation and maintenance management, and optimization allocation mechanism involved in the water replenishment process.

Objectives

- Improve the efficiency of water resource utilization
- Utilize multiple water sources for ecological replenishment of urban rivers and lakes and optimize the allocation mechanism of replenishment
- Restore the service functions of river and lake ecosystems, and achieve sustainable and healthy urban development.

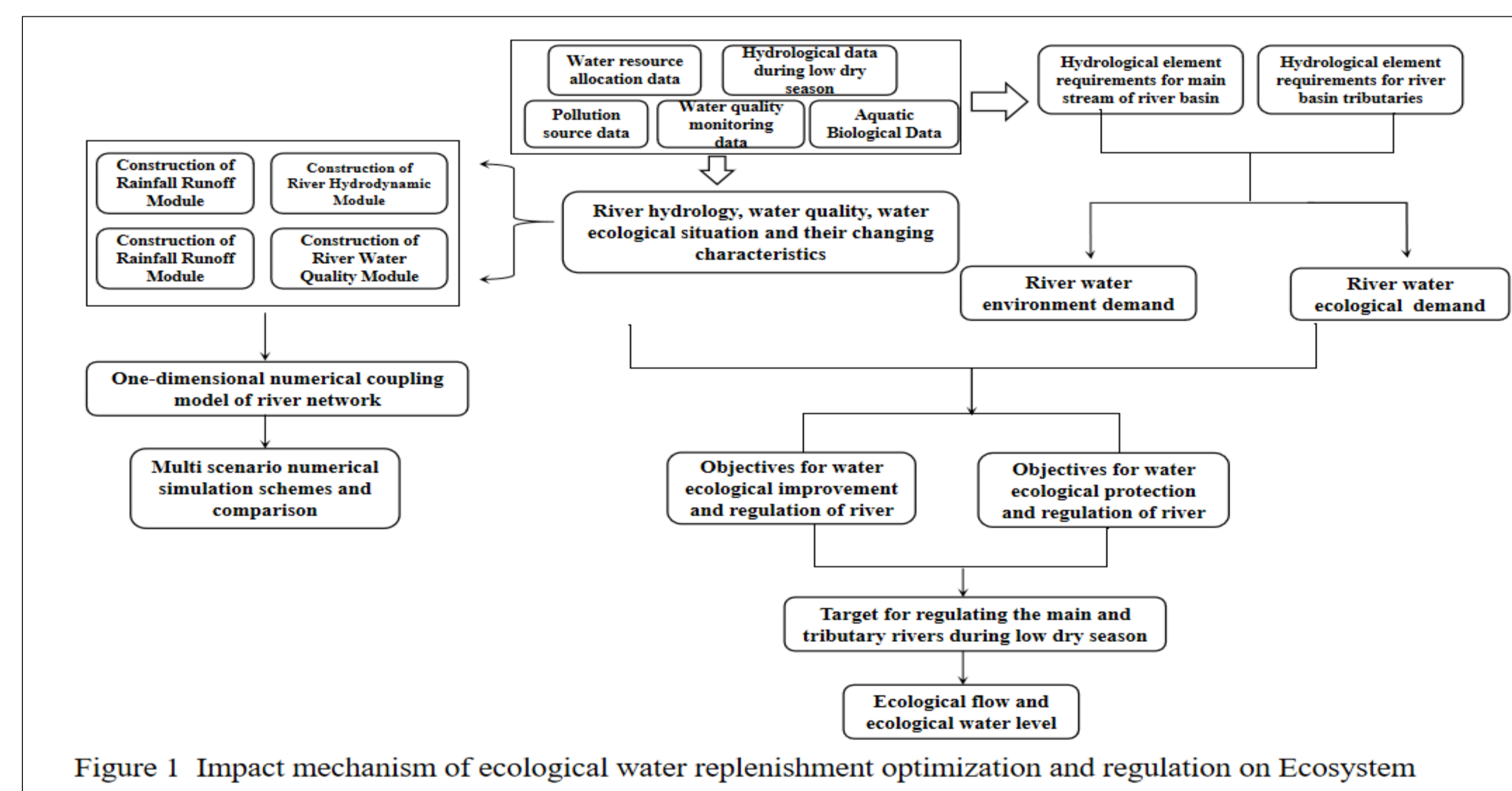


Figure 1 Impact mechanism of ecological water replenishment optimization and regulation on Ecosystem

Conclusions

- Ecological water replenishment regulates the physical and chemical indicators of water environmental factors, promoting the ecological evolution of rivers and lakes; it strengthens the hydrological connectivity of the watershed, promotes ecological regulation and storage, and reshapes the characteristics of the watershed.
- This study combines the construction of ecological water replenishment projects with the concept of near natural ecological water replenishment, by matching the natural rhythm of water flow fluctuations required for the survival of aquatic organisms in rivers and lakes, to restore the balance of river and lake water ecosystems.

Table 1 Comparison between existing water replenishment modes and near natural ecological replenishment modes

Operating mode	Near natural ecological replenishment mode	Existing replenishment mode
Target	Reduce water environmental issues; Ecological Restoration, utilize ecological service functions	Landscape and engineering demand
Object	River morphology, river engineering, ecological restoration, pattern optimization	River engineering structures and supporting works
Assignment	Optimizing water allocation, ecological protection, ecological restoration of rivers and lakes	Landscape effect and engineering safety
Mode	Optimization of river and lake conditions	Changes in the state of rivers and lakes
Operations management	Dynamic management of near natural ecological replenishment	Static management of minimum water demand

Methods

- Ecological hydraulic radius method
- MIKE11 one-dimensional hydrodynamic model

Results

Calculate the ecological water volume based on the ecological hydraulic radius method, and use this result as the basis for near natural ecological replenishment.

After natural ecological water replenishment, the current situation of the drying up of the upstream river channel of the river has been effectively improved, and the shortage of ecological water in the downstream has also been alleviated.

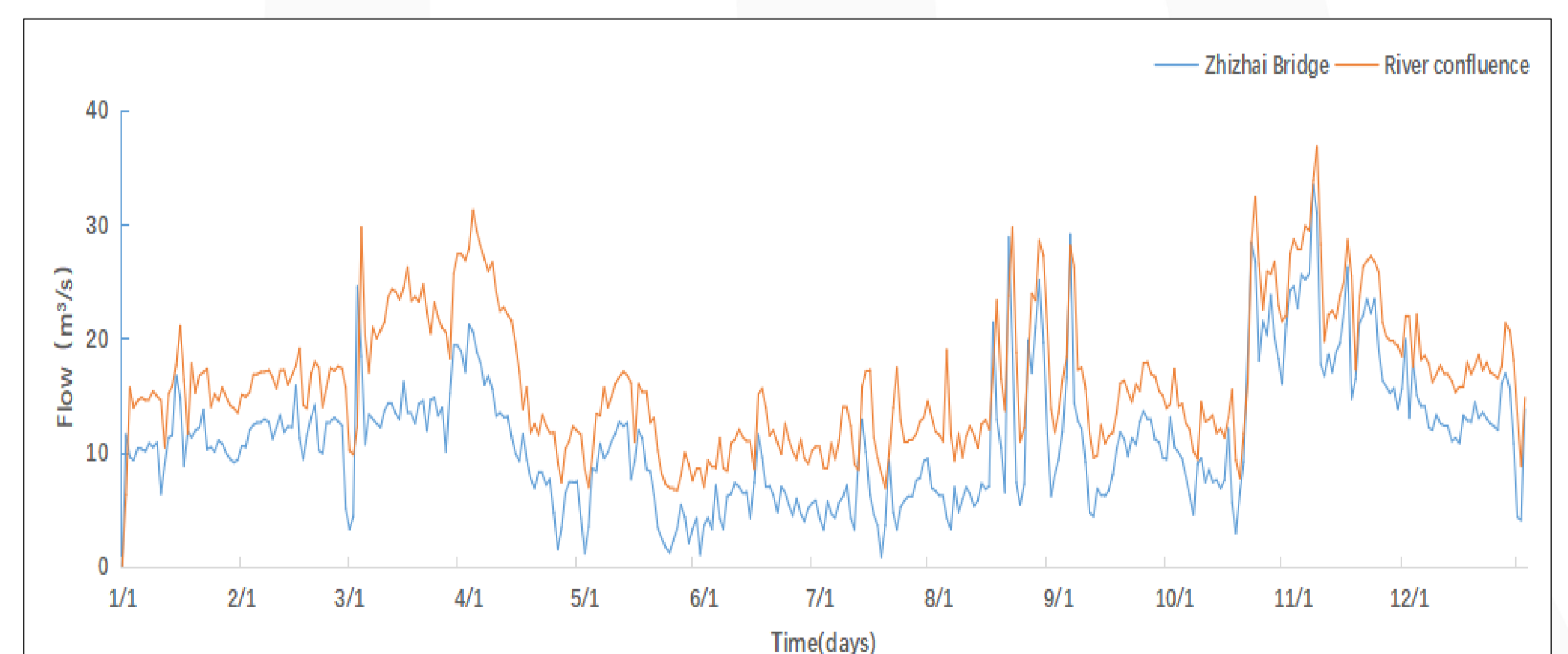


Figure 3 Simulated variation of water replenishment flow at typical sections in rainy years

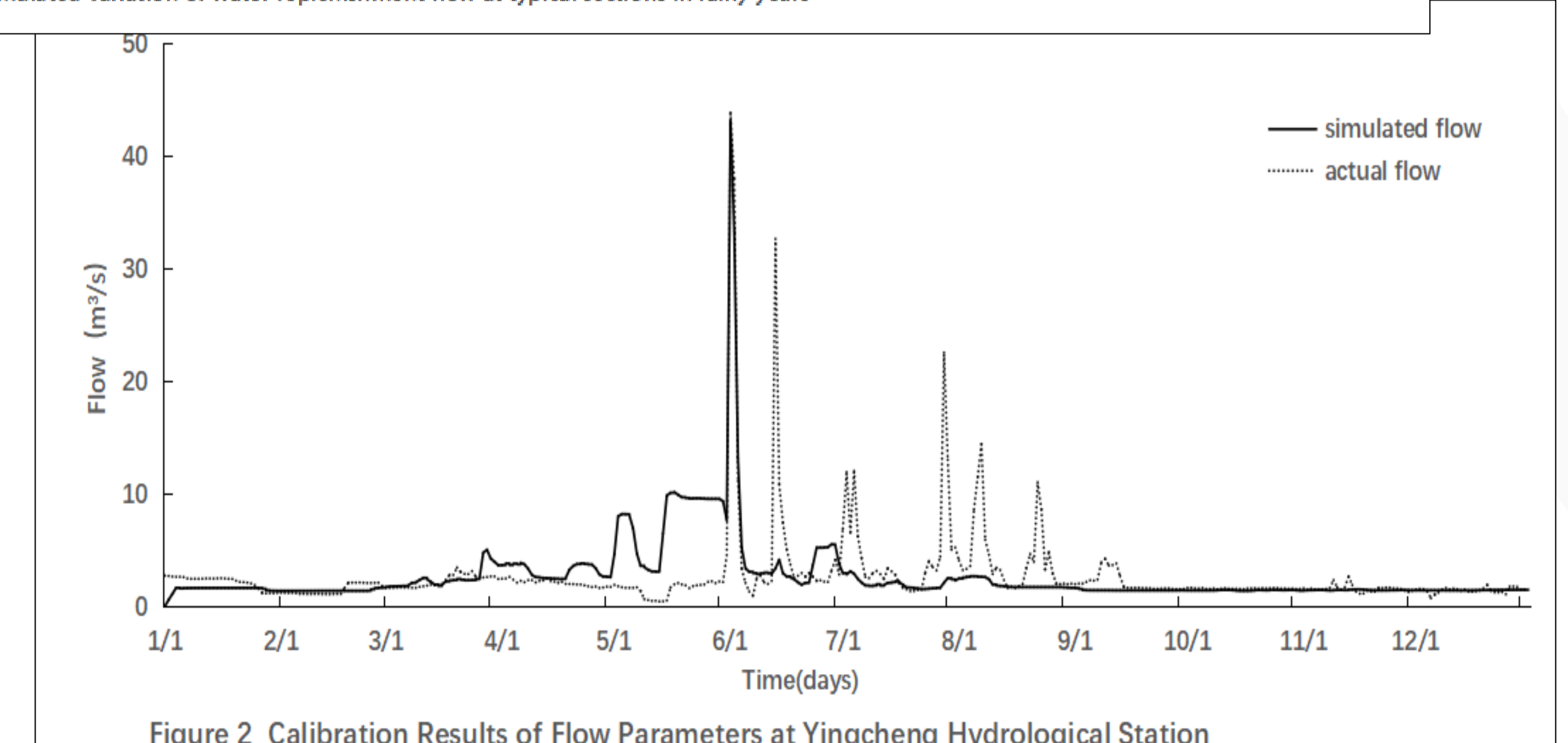


Figure 2 Calibration Results of Flow Parameters at Yingcheng Hydrological Station