Research on the judgment Method of Hydrological Year Type under the influence of human activities

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Objectives

With the development of economy and society, the human activities in North China are becoming more and more intensive, the variation of land cover and utilization, the aggravation of urbanization and other factors have changed the process and spatial pattern of water resources circulation, it leads to the high complexity of water resources circulation system in North China, which brings a new challenge to the simulation and prediction.

Due to the impact of climate change and human activities, the differences in rain-flood frequency of Yongding River have significantly varied. This study focuses on the new practical judgment method about hydrological year types, which is crucial for water allocation involving inter-provincial rivers.

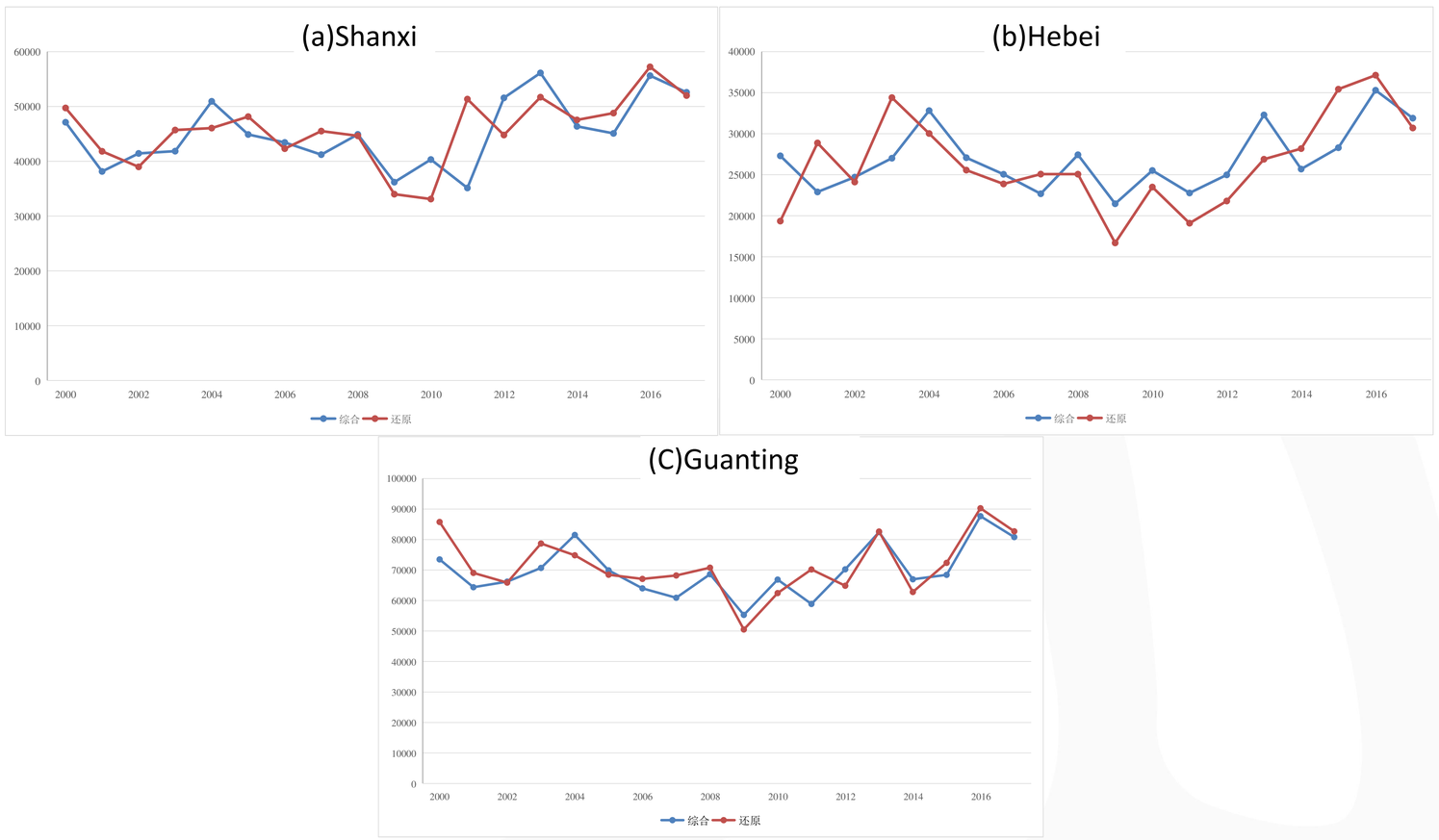

Fig. 1 comparison of simulation effect and reduction series of integrated optimization mode
The red line in the figure shows the amount of reduced water resources, in contrast, the blue line shows the simulated amount of water resources.

Methods

In this research, we analyze the evolution of water resources in this basin and construct a mid-and-long term runoff forecast model, which is coupling the SWAT model, VIC model, and statistical analysis models in a regional ensemble system. At the same time, considering the many formitions of water source in spring flood and the process of each factor is complex, we have innovatively developed a technical method for predicting spring flood, which is Based on Big Data Mining Technology; Then by coupling a technical method for predicting spring flood and mid-and-long term runoff forecast model, we can get accurately simulate the amount of water resources. Additionally, we propose a method for solve qualitative judgment of the hydrological year types in Haihe River Basin.

Results

Our results indicate that the natural annual runoff in this three areas have shown a downward trend, with the Yongding River in Hebei having the most significant decrease, followed by Yongding River in Shanxi. The mutation points of annual natural runoff series in Shanxi, Hebei, and Guanting of Yongding River occurred in 1979, 1983, and 1986 respectively. By using the spring flood prediction model to correct the runoff in March and April of the hydrological model, we have significantly improved the simulation accuracy. The modified SWAT and VIC models have demonstrated their applicability in simulating the natural runoff process. The optimized ensemble model has achieved a high accuracy rate above 73% for both the calibration period and the verification period.

Conclusions

we have significantly improved the accuracy of the hydrological year type determination model, transforming it from a traditional qualitative judgment method to a quantitative model method, providing strong technical support for rational water resource allocation under ecological water replenishment conditions.

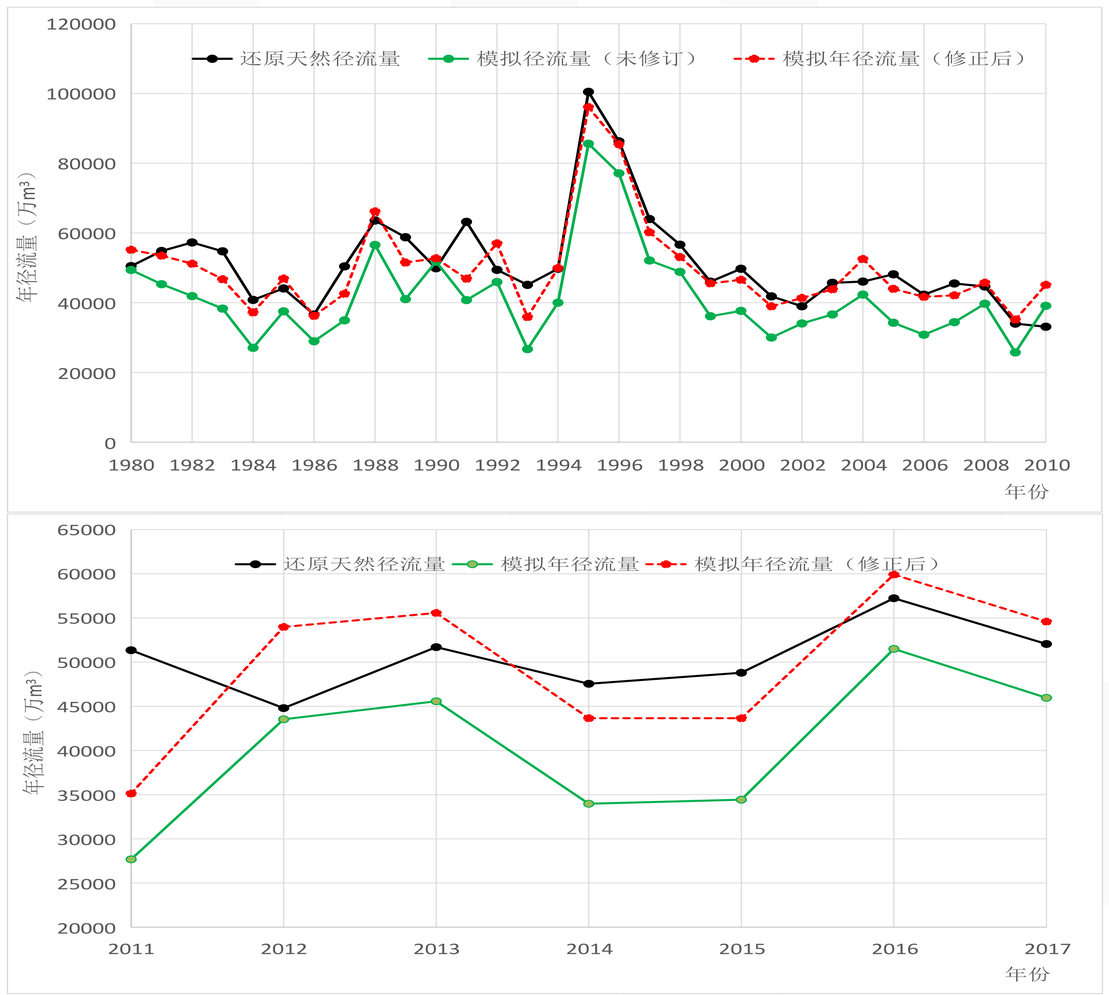

Fig. 1 comparison of simulated water resources between regular and inspection periods (Yongding River region)