

Magnitude, frequency and timing of floods in the Hongze Lake: Characteristics, causes, and impacts

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Objectives

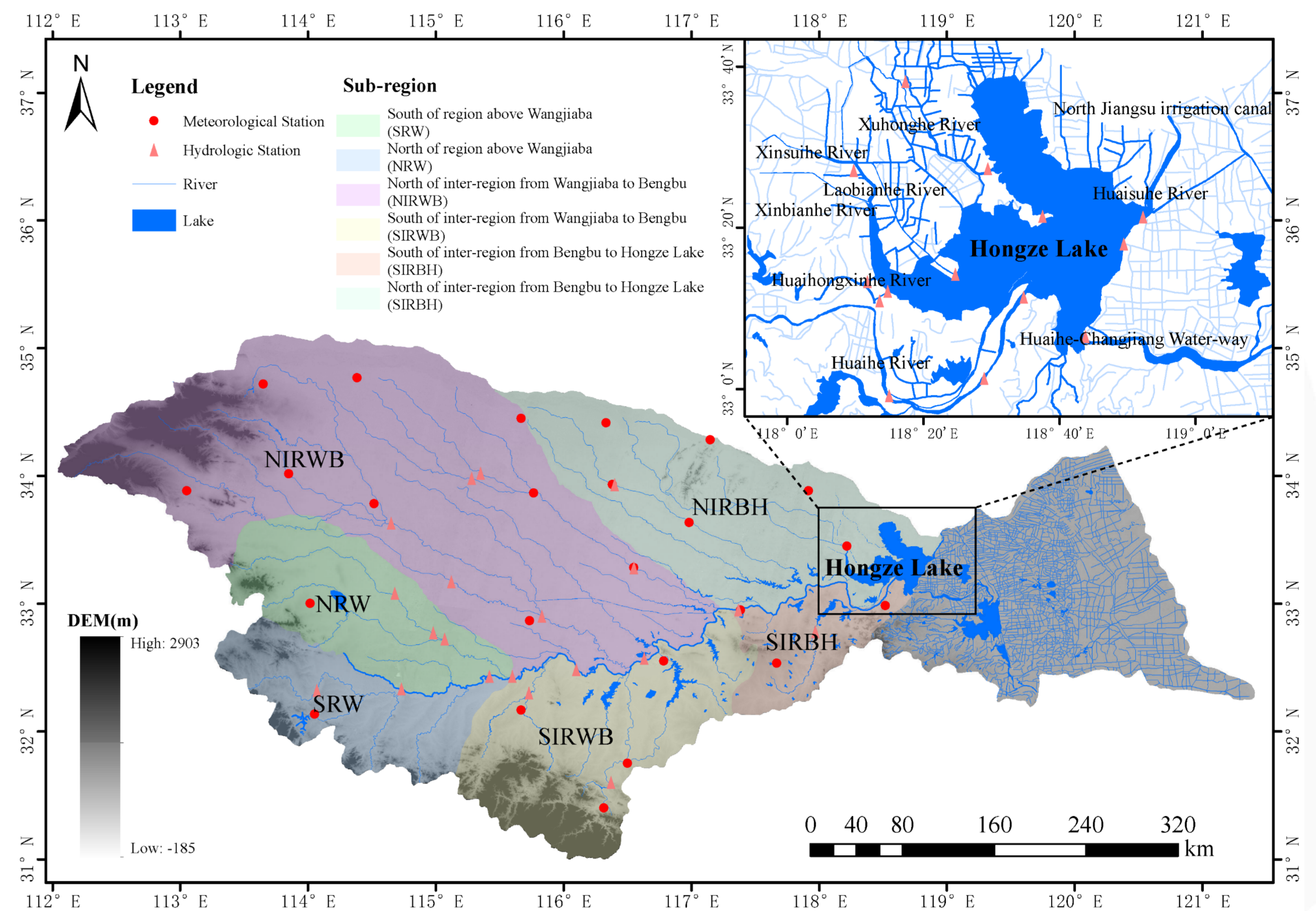
In recent years, influenced by human activities and climate change, extreme hydrological events have occurred frequently in the middle and upper reaches of the Huaihe River Basin, and droughts-floods abrupt alternation become more intensified, resulting in significant changes in the water balance between the basin and Hongze Lake. The phenomenon of water level and runoff abnormal fluctuation, which are extremely unfavorable to the development of flood resource utilization in the basin. Therefore, based on the analysis of spatial and temporal variation patterns and extreme characteristics of meteorological elements in the basin, this paper uses various mathematical and statistical methods to reveal the multi-timescale variation characteristics of flood elements in Hongze Lake in the past 60 years, and focuses on the transformation patterns of flood indicators since 2000.

Methods

This paper used Wavelet Analysis, Mann-Kendall Test (M-K), Breaks for Additive Seasonal and Trend Method (BFAST) and other statistical methods to analyze the tendency, periodicity, and mutagenicity change characteristics of the lake's inflowing runoff. Moreover, Peak over Threshold method (POT) and Annual Maximum method (AM) were selected to construct 9 characteristic indicators for analyzing the magnitude, frequency and timing of floods of the Hongze Lake since 2000

Results

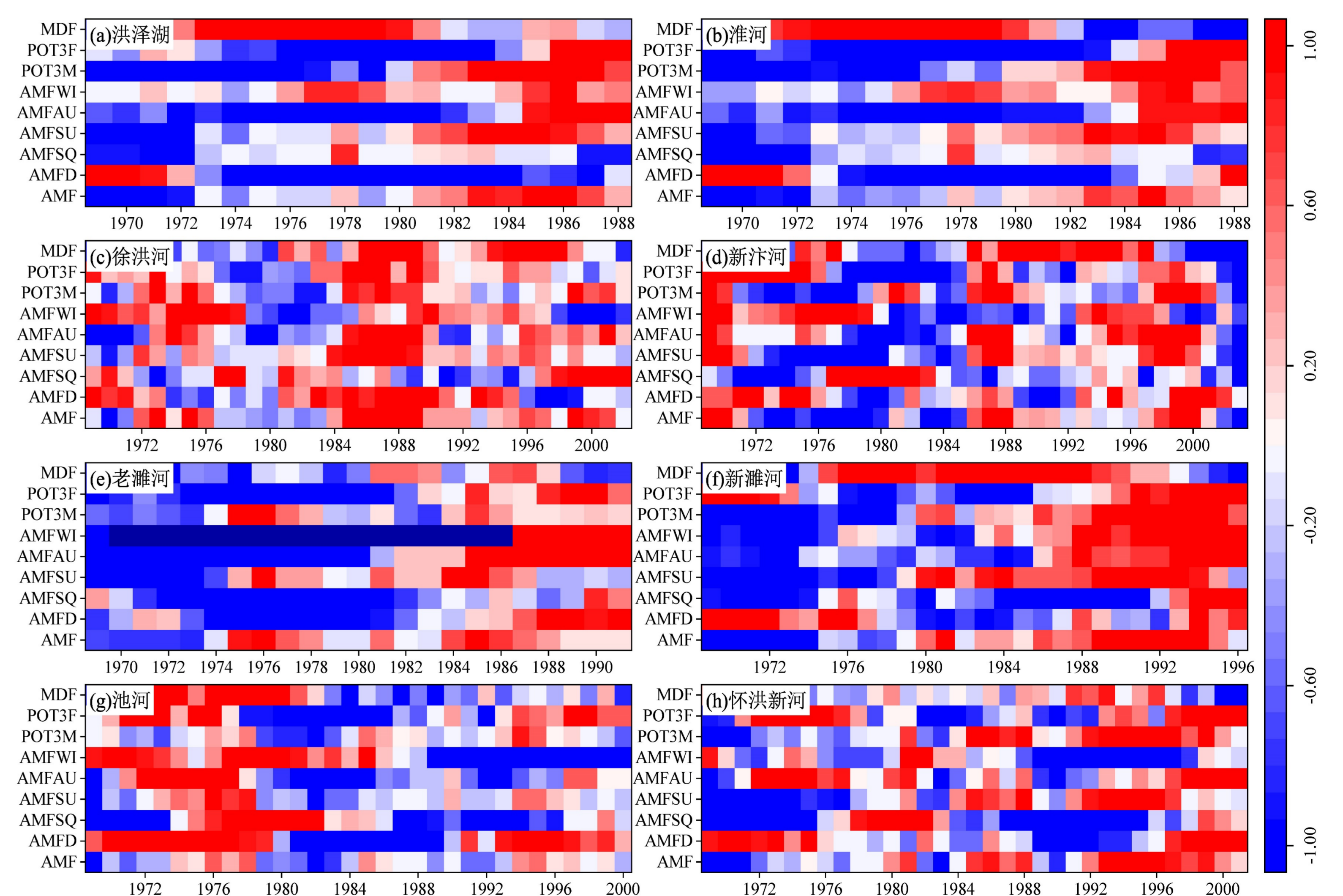
The results show that: 1) in the past 60 years, the Hongze Lake Basin become more warming and humidification, accompanied by a significant increase in the frequency of extreme heavy rainfall events, potentially increasing the difficulty and risk of flood resource utilization; 2) the water level of Hongze Lake has shown a rising trend between years, with frequent high water level phenomena after 2000, followed by an increase in the flood inundation area and flood duration due to water level fluctuations; 3) since 2000, the runoff flowing into the lake has shown a more obvious decreasing trend, but the maximum flood peak has shown a significant increasing trend, while the occurrence of floods in autumn and winter has increased.



Location of the Hongze Lake Basin and its rivers and gauging station

Conclusions

The changes of flood characteristics in the Hongze Lake Basin provide objective conditions for the implementation of flood resource utilization. However, it also put forward more refined regulation and control requirements.



The M-K variations of the flood indices for the Hongze Lake