

Analysis on the evolution of water resources situation in Qiandao Lake Basin from 1960 to 2020

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Abstract

To analyze the evolution of water resources in Qiandao Lake Basin under the condition of climate change, a WEP-L distributed hydrological model was established to simulate the water cycle process in the basin during 1960-2020. The Mann-Kendall non-parametric test method and Hurst index method were used to analyze the inter-annual variation and annual distribution characteristics of the total water resources in the basin. The multi-scale temporal and spatial distribution and evolution trend of water resources in Qiandao Lake Basin were evaluated. The results show that: (1) The WEP-L model has good simulation results in the Qiandao Lake basin, and the Nash coefficient rate is above 0.83 in the periodic period and above 0.85 in the verification period. (2) The water yield coefficient of the whole basin ranges from 0.436 to 0.630. The annual average total water resource is 12.25 billion m³, equivalent to 1176.4mm of water depth. The annual distribution process shows a unimodal structure, and the water depth of each sub-basin ranges from 742 mm to 1266 mm, and the spatial distribution is higher in the west and lower in the east. (3) The annual water resources series in the basin showed an insignificant upward trend, and the Hurst index was 0.86, indicating a continuous upward trend. From the perspective of monthly water resources, January and February increased significantly, the other months were not significant changes.

Key words: WEP-L model; evolution of water resources; Qiandao Lake basin; multi-scale temporal and spatial distribution