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Study on water allocation in Taizhou,Zhejiang, China

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As the increasing water demand and serious water pollution, conventional allocation pattern, which mainly considers water quantity as the key factor, is no longer satisfying the water allocation need. A coupled water quantity-quality model in a river basin is presented in this paper to provide a tool for water allocation schemes analysis. The pollutants transport and hydrological cycling processes in a river basin are involved in the model. A river network is divided into different reaches. According to the division of river network, the areas out of the river are divided into a series of tanks. In each tank, hydrologic processes, pollutant loading production, water demand of users and water supply are calculated. In river network, hydrodynamics processes and water quality are simulated. Water quantity and quality exchanges between each tank and river are also considered.
The time step of water quality calculation is 24 hours, the same with that of water quantity calculation. In each time step period, the connections of river reaches and tanks are realized through the exchange of water quantity and quality between rivers and tanks: pollutants discharge from tanks to rivers and water intake from rivers to satisfy water demand in tanks. The water use in each tank includes three types: domestic, industrial and agricultural water use. Water allocation schemes are one of the input conditions of the model. Using the proposed model, in each tank, water demand and deficit of different uses, in both water quantity and quality, can be obtained under different water allocation schemes. According to the water deficit, water allocation schemes are analyzed to make proper allocation schemes. In this aspect, the proposed model can also be thought as a water allocation model.
The model is applied to the Taizhou, Zhejiang Province, China, which has mountain areas and plains characterized by farmland, reservoirs and complex river network. During calculation, the river network is divided into 13 reaches with 13 nodes and 31 sections, and the area out of the river is divided into 22 tanks. Daily rainfall and evaporation data from 1961 to 2000 are used. Water demands of the 22 tanks and pollutants loading from the 22 tanks are required by the model as input data. Based on the daily water demand-supply balance calculation, water deficit in the twenty tanks in 2020 is analyzed, respectively. Two water allocation schemes are involved. The water quality in the river network is simulated in the 40-year hydrologic series with different water allocation schemes. Using the developed model, the effects of two measures for water quality improvement on the water allocation are also analyzed.
Key words: coupled water quantity-quality model; water allocation; river network; water allocation; Taizhou;water decifit;river basin