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Integrated model of regional water resource and environment based on Generalized ET control

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Water resource is becoming a dually natural-artificial driving mode, which has intertwined with the agronomic-economic-ecologic-environmental system. Traditionally, the water resource planning and management was realized by control of the amount of water extracted and the amount of water drained. In this paper, another approach, controlling the amount of evapotranspiration(ET) on natural and artificial level, was discussed. Based on ET control theory, Water Quantity and Quality Simulation Model (WQQSM) was developed and applied in Tianjin City, China. The WQQSM, which can simulate and analyze ET, water quantity and quality of the natural and artificial water cycle, is composed of three interoperative computational modules: SWAT, MODFLOW and Artificial Water Optimize Allocation Module (AWOM). In the calibration and validation periods, a "piece-by-piece" approach was applied to verify the model from four aspects: surface water quantity, groundwater quantity, surface water quality and integrated ET of the region. The resulting validated model demonstrated that the WQQSM developed in this paper could be used as a pragmatic tool to realize ET control and water resource & water environment planning in a region or watershed.