



Integration application of finite difference flow modeling and SWAT model in the distribution and transformation of water resources in irrigation areas

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Received 3 December 2023; Accepted 25 September 2023

ABSTRACT

The current strange way in irrigation areas has led to the problem of shallow groundwater overexploitation and continuous decline in groundwater level during the hydrological cycle. Therefore, a coupling model is constructed by integrating the modular three-dimensional finite difference groundwater flow model in finite difference flow modeling with soil and water assessment tools, and its effectiveness and practicality are verified. The experimental results showed that the model maintained the infiltration rate of precipitation in the irrigation area between 0.11 and 0.27, the infiltration rate of irrigation between 0.3 and 0.4, and the infiltration rate of the soil and water assessment tool model between 0.21 and 0.26. The coefficients of determination of the five verification wells in the coupling model comparison were 0.72, 0.13, 0.72, 0.54, and 0.32, respectively, with good fitting effect; the spatial interpolation results of the measured groundwater level related data and the 60 m flow field line in the coupled model simulation results were both located in the middle of the irrigation area, which was superior to the comparative model. In addition, when the coupled model was applied to the actual distribution and transformation of water resources, the correlation coefficient between soil moisture content and irrigation amount under mining irrigation conditions was 0.21, showing a positive correlation between the two; the correlation coefficient between soil water infiltration and precipitation under non mining irrigation conditions was 0.46, showing a positive correlation. Overall, the coupling model has good coupling effect and effectiveness, while in practical applications, the simulation results are basically in line with reality and have practicality. It can provide data support for promoting water-saving irrigation and optimizing irrigation systems in irrigation areas.

Keywords: MODFLOW; SWAT; Coupling model; Irrigation area; Groundwater

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