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The simulation of groundwater spatiotemporal changes under the uncertainty of hydrogeological conditions

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Groundwater is a reliable freshwater resource in many areas, and it is also an important source of backup water during the drought. Therefore, understanding the characteristics of groundwater resources is crucial and can be explored by building correct hydrogeological models for simulation. To build a perfect hydrogeological model, it is necessary to grasp the correct geological conditions and hydrogeological parameters to establish an effective numerical simulation of groundwater flow. However, geological conditions always contain some uncertainties, which may cause a certain impact on the spatiotemporal changes of groundwater.

Therefore, this study uses the groundwater flow numerical model, MODFLOW, to build the groundwater simulation model. The ideal case and real case at Touqiao Minshung Industrial Zone in Chiayi is built from 2009 to 2013. The results show that under different hydrogeological parameters, geology, and other conditions, groundwater will have different patterns of variation. The Empirical Orthogonal Function (EOF) method is also used to compare the dominated patterns. The simulation results show the R^2 can all reach 0.9 compare with the groundwater real observation data. This study can further explore the drought-resistant availability of groundwater in various regions under different geological conditions, it will help relevant agencies and local governments to better manage groundwater resources.

Keywords: groundwater simulation, MODFLOW, uncertainty, hydrogeology, EOF

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