

## **A genetic algorithm based groundwater simulation-optimization model under variable-density conditions**

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**Abstract** A new groundwater simulation-optimization model, named SWTGA, was developed by coupling genetic algorithm (GA) with SEAWAT, which is a density-dependent groundwater modelling tool based on the theory of a transition zone between freshwater and saltwater. The purpose of developing SWTGA is to provide a new effective tool, which can be used to solve groundwater management problems under variable-density conditions based on the theory of a transition zone between freshwater and saltwater so as to scientifically and technically assist the decision makers to determine the strategies for sustainable use and reasonable management of groundwater resources. During the development of SWTGA, a general form of the objective function suitable for a wide variety of groundwater management problems under variable-density conditions is presented and a general density-dependent groundwater management model is subsequently created. In this study, SWTGA is specifically designed and developed to solve the general density-dependent groundwater management model. Finally, the new model is successfully applied to optimal design of the groundwater pumping scheme for a theoretical coastal aquifer system, which demonstrates its effectiveness and robustness.

**Key words** groundwater; optimization algorithm; SWTGA; variable-density flow; genetic algorithm