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Genetic programming in groundwater modeling

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Abstract

Determination of water-table elevation corresponding to aquifer recharge or discharge is an important issue in sustainable groundwater management. This approach necessitates the application of numerical simulation models that may require lots of input data related to aquifer parameters and specifications, even for modeling a part of the aquifer, which makes the calculations expensive. Moreover, comprehensive aquifer modeling is a time-consuming and computationally-intensive process. Artificial intelligence tools can replace simulation models and decrease computational efforts by using input and output data sets without considering complex relations of the system to be modeled. This paper employs adaptive neural fuzzy inference system (ANFIS) and genetic programming (GP) as artificial intelligence tools to extract governing groundwater flow equations in Ghaen and Karaj aquifers in Iran. For both aquifers, several input-output data sets, for both training and testing data sets, are determined by using a developed numerical simulation model (iterative alternating direction implicit method, IADIM). In addition, the water-table elevation at each cell in the model is considered to be a function of aquifer

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