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Groundwater table estimation using Modflow and artificial neural network

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Groundwater models provide a scientific and predictive tool for determining appropriate solutions to water allocation, surface water – groundwater interaction, landscape management or impact of new development scenarios. For many practical problems of groundwater hydrology, such as aquifer development, contaminated aquifer remediation, or performance assessment of planned water supply projects, it is necessary to predict water table and its fluctuation during the year. Using numerical models to simulate groundwater flow has been addressed in many works and researches in past decades. The main draw back with these models is the enormous and generally difficult or costly data requirements. On the other hand, artificial neural networks (ANNs) are offering a simple but precise solution to many simulation problems. ANNs are computational modeling tools that have recently emerged and found extensive acceptance in many disciplines for modeling complex real-world problems.

In this paper, the applicability of ANN models in substitution of Modflow has been investigated. In order to be able to use ANN model for aquifers with limited data, Modflow was used to simulate the groundwater flow and calibrated model was applied to generate hundreds of data set for ANN model. Then, using the generated data set, ANN model was trained. In addition, another purpose of this paper was to identify ANN models that can capture the complex dynamics of water table fluctuations, even with relatively short length of training data. The measured water table elevations were used to compare the performance of both Modflow and ANN model.