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Application and Comparison of Three Data-driven Prediction Models for Groundwater Level Dynamics

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Evaluation and prediction of groundwater levels by using data-driven models help in the management of groundwater resources. This study is to investigate and predict the variation of groundwater level dynamics in the plain of Shijiazhuang, the capital city of Hebei Provence, China. Three different data-driven models are assessed, which include the Multiple Linear Regression (MLR), the Support Vector Machines (SVM) and the Back-Propagation Artificial Neural Network (BPANN). Depth and exploitation quantity of groundwater recorded from 76 observation wells are obtained together with the precipitation observed at rainfall stations in the study area for 20 years from 1984 to 2013. The model building process and the accuracy of the three data-driven methods are discussed in the assessment of their relative advantages and disadvantages, based on statistics of Absolute Error (ABE), Relative Error (RE), Maximum Error (ME) and Average Error (AVE). The results show that both SVM and BPANN models had sufficiently high accuracy in reproducing groundwater levels, and SVM performed even better. This may provide a reference for the prediction of groundwater resources in the study area and help in the management of the groundwater decline in the Huabei Plain of China.

Keywords: groundwater level dynamics, data-driven method, Support Vector Machines, Back-Propagation Artificial Neural Network