Prediction of Groundwater Dynamic in Ganzhou Region of Middle Heihe River Basin Using Artificial Neural Network

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Abstract:

Revealing the temporal variation characteristics of shallow groundwater depth (GWD) can provide scientific basis for evaluating and managing groundwater resourcesthrough simulatingand analyzingof GWDmonitoring data.In order tofully and accurately reflect the groundwater dynamics in the study area, select the 10 observation wellsdata as representatives.The change process of groundwater table with time is a complex nonlinear process, and the groundwater system is one kind of complicated nonlinear system, so it is difficult using the present various methods to predict the change to be applied commonly in practice. A sort of new prediction method was proposed for the groundwater table series with complex fluctuation.As adeveloping cross-science, the artificial neural network is an efficient method to deal with the nonlinear problems. to overcome the shortcomings of the traditional BP network, an improved LM-BP neural network method based on the bipolarity S function is proposed for groundwater depth dynamic prediction, the method has the advantage of the bipolarity S function, a positive or negative output, and the benefits of the Levenberg-Marquardt (LM) algorithm, both the global property of the Gradient Dencent algorithm and the partial property of the Gauss Newton algorithm. LM-BP neural network is established and applied in groundwater dynamic simulation and prediction of Ganzhou region of middle Heihe river basin. The Levenberg-Marquardt algorithm could minimize the error.The modeling results were evaluated with the correlation coefficients,relative error, etc. The results showed that the improved model could improve model's simulation precision and stability. In carrying out the prediction, it is not necessary to analyze various kinds of factors affecting groundwater depth dynamics, but it is only necessary to have a series of groundwater depth dynamic observation data with a certain length, whereby avoiding data collection and sorting-out. This method is effective and feasible for groundwater depth dynamic prediction, compared with other methods. And its prediction results are more objective and reasonable. As a new method, the improved LM-BP network method has high prediction accuracy and a high convergence rate. The case study shows that model has prominent fitwhich is important to estimate groundwater depth by using precipitation data.The results provide a reference to develop irrigation system and play a crucial supporting role for the agricultural and economic development.

Key words: artificial neural network; groundwater depthdata; data prediction