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Comparison of three updating schemes using artificial neural network in flow forecasting

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Abstract. Three updating schemes using artificial neural network (ANN) in flow forecasting are compared in terms of model efficiency. The first is the ANN model in the simulation mode plus an autoregressive (AR) model. For the ANN model in the simulation model, the input includes the observed rainfall and the previously estimated discharges, while the AR model is used to forecast the flow simulation errors of the ANN model. The second one is the ANN model in the updating mode, i.e. the ANN model uses the observed discharge directly together with the observed rainfall as the input. In this scheme, the weights of the ANN model are obtained by optimisation and then kept fixed in the procedure of flow forecasting. The third one is also the ANN model in the updating mode; however, the weights of the ANN model are no longer fixed but updated at each time step by the backpropagation method using the latest forecast error of the ANN model. These three updating schemes are tested for flow forecasting on ten catchments and it is found that the third updating scheme is more effective than the other two in terms of their efficiency in flow forecasting. Moreover, compared to the first updating scheme, the third scheme is more parsimonious in terms of the number of parameters, since the latter does not need any additional correction model. In conclusion, this paper recommends the ANN model with the backpropagation method, which updates the weights of ANN at each time step according to the latest forecast error, for use in real-time flow forecasting.

Keywords: artificial neural network (ANN), updating, flow forecasting, backpropagation method

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