Application of the grey self-memory neural network model for annual runoff forecasting

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Abstract A runoff time series represents the hydrological response to a catchment, which is a nonlinear, weakly dependent, and highly complicated dynamic system. The key to improving the accuracy of runoff forecasting is to dig the information from the limited sample sufficiently. Grey system modelling reveals the law of system dynamics by processing grey information; self-memory theory emphasizes the fore-and-aft relation of system status, which urges upon evolutionary rules of system itself. Then differential equations of the dynamic system could be built for the self-memory models. Combination of grey theory and self-memory theory can effectively represent the trend of the extreme values for the time series, but there is a phase lag between observed values and predicted values. The neural network has an advantage of solving nonlinearity of the system. Based on the idea of integrative forecasting, the grey self-memory neural network model was established, which can be used to predict the annual runoff series.

Key words grey system; self-memory model; neural network; annual runoff