Abstract

Accurate prediction of missing hydro-meteorological data is crucial in planning, design, development and management of water resources systems. In the present research, prediction of such data using Artificial Neural Networks (ANN) based on temporal and spatial auto-correlation has been conducted for upper Tana River basin in Kenya. Different ANN models were formulated using a combination of numerous data delays in the ANN input layer. The findings show that the best models comprise of a feed-forward neural network trained on LevenbergMarquardt algorithm with single hidden layer. Additionally, the best ANN architecture model for predicting missing stream flow data was at gauge station 4CC03 with correlation coefficient and MSE of 0732 and 0.242 respectively during validation. Temporal auto-correlation of the observed and the predicted stream flow values were evaluated using a correlation coefficient R that resulted to highest value of 0.756 at gauge station 4AB05. The best ANN model for prediction of missing precipitation data was at station 9037112 with R value of 0.970. In both cases the best performance was at epochs 9 and 20 respectively. The spatial auto-correlation show that the best ANN architecture model for prediction of missing stream flow data was at gauge station 4CC03 with R value of 0.723, while the one for precipitation was at station 9037096 with R value of 0.712 during the validation. The results indicate that the spatial auto-correlation of hydro-meteorological data using ANN is better than the temporal autocorrelation in the data prediction in upper Tana River basin.