Geophysical Research Abstracts, Vol. 9, 09670, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-09670

River flow forecast based on previous precipitation and streamflow information using artificial neural networks

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This study presents the evaluation of the performance of a streamflow forecasting model based on a feed-forward multilayer artificial neural network (FMANN) in a catchment with limited dataset, in the context of the Hydroinformatics Forecasting Contest. Forecasts for the next 6 and 24 hours are provided using data of observed rainfall and streamflow up to the time of forecasting start. This data was sampled at 6 hourly intervals and derive from recorded observations for Bird Creek, Oklahoma, USA. The catchment drainage area is some 2344 km2. Two different FMANN models were developed. One for the 6 hours forecast horizon and the second, for 24 hours forecast horizon. At first, correlation analysis was used to define the most relevant input variables to the models. Later, a trial-and-error analysis verified if other complementing input variables could improve the performance of the models. In the case of the 6 hours horizon a three layer artificial neural network with three input neurons presented the best results. The network was fed with data from rainfall accumulated over the last twelve time steps, the last observed streamflow and the streamflow increment between the last two consecutive time steps. In the case of the 24 hours horizon a three layer artificial neural network with seven input neurons performed best. In this case the network was also fed with rainfall data accumulated over five different time intervals, the last observed streamflow and the streamflow increment between the last two consecutive time steps. Both FMANN were trained using the back-propagation algorithm. The mean squared error function and cross validation stopping criterion were used for determining the best training stop moment. Results were compared to naïve predictions based on streamflow persistency, showing better performance. Forecasts in the range of 24 hours show poorer results than that in the 6 hour range, showing

that rainfall forecasts should be used in the case of longer forecasting horizons.