

Interactive comment on “A novel approach to parameter uncertainty analysis of hydrological models using neural networks” by D. L. Shrestha et al.

F. Fenicia (Referee)

f.fenicia@tudelft.nl

Received and published: 27 April 2009

The paper presents a method to estimate prediction intervals produced by a hydrological model (HBV) through a neural network model. Provided that an ANN can accurately reproduce model results, the advantage of the approach would be a faster computation time.

While the approach can be of potential interest for flood forecasting, I find that the paper requires substantial revisions to really show the advantages and the novelty of the approach.

First of all, I think the paper is poorly referenced. The approach of simulating a higher
C424

order model through a lower order model is not new, and this has not been thoroughly discussed (see for example Young and Ratto, 2009, and references therein). Hence, I think that the authors should better demonstrate what is new in their approach in respect to what has been done before.

The other important point, is that the authors compare a neural network model in forecast mode, to a HBV model in hindcast mode. In my opinion, in order to have an objective comparison, the HBV model should also be run in a forecast mode.

Furthermore, the authors should note that the HBV prediction intervals do not represent the probability of discharge falling within the intervals. Hence they should clarify their application in a view to flood forecasting.

The authors show how Monte Carlo uniform sampling is an inefficient sampling strategy. There are more efficient sampling strategies such as Markov Chain Monte Carlo sampling, which are not taken into proper consideration by the authors. Furthermore, the authors do not mention that when the model is run in a forecast mode, there is no need to re-run the model for the whole past time series. Prediction intervals can be estimated in a Bayesian recursive estimation approach (Thiemann et al., 2001).

Finally, I think the paper would benefit from a comparison of the two approaches (HBV and ANN) using different lead times. It would be interesting to see if ANN, due to their difficulties of accounting for lag times within the system, have lower performance for higher lead times.

Young, P.C., Ratto, M., 2009. A unified approach to environmental systems modeling. Stochastic Environmental Research and Risk Assessment. doi:10.1007/s00477-008-0271-1.

Thiemann, M., M. Trosset, H. Gupta, and S. Sorooshian (2001), Bayesian Recursive Parameter Estimation For Hydrologic Models, Water Resour. Res., 37(10), 2521–2535