Geophysical Research Abstracts, Vol. 8, 09732, 2006
SRef-ID: 1607-7962/gra/EGU06-A-09732

Numerical flow separation and committees of neural networks in streamflow forecasting

G. Corzo and **D.P. Solomatine**
UNESCO-IHE Institute for Water Education (d.solomatine@unesco-ihe.org)

Due to the problems related to adequate calibration of hydrologic and weather models calibration and the data uncertainty, ensembles of models are becoming more and more popular in streamflow forecasting. However, the ensemble is not the only way to combine models. This paper presents a method of building a committee of data-driven models that is based on the use of flow separation - this makes it possible to build separate models for base and high flow. We use an artificial neural network (ANN) which usefulness in the capacity of a rainfall-runoff model has been proven by many researchers.

In hydrology there are several methods known that allow for separation of base and high flow. In this paper, two of them were tested: graphical method, and the so-called numerical flow separation method. They are used to produce two time seria - for the base and the high flow. Two different ANNs are trained to forecast flow on the basis of past measurements of rainfall and flows; average mutual information is used to identify the proper lags. It is demonstrated that such modular model is more accurate than the model trained (calibrated) on the whole data set.

ANNs are often criticized as being “black boxes”. The presented approach allows to make a step towards hybridization of data-driven models by the explicit introduction of hydrologic knowledge, leaving however the tedious task of building a non-linear regression to a machine learning method. We show that identification and separation of regimes improve the accuracy of ANN-based flow forecasting models. In order to improve the model performance, the coefficients of the numerical flow separation formula were further optimized by multi-criterial optimization methods. An alternative to automatic optimization is giving the task of improving the results of the flow separation to a hydrologist.

The use of flow separation together with the modular data-driven models introduces the hydrologic knowledge into the hydrologic modelling cycle, and leads to the better model performance.