Geophysical Research Abstracts, Vol. 8, 06932, 2006
SRef-ID: 1607-7962/gra/EGU06-A-06932

Soft Combination of Local Hydrologic Models in Multi-Objective Setting

D.P. Solomatine (1), F. Fenicia (2,3), H.H.G. Savenije (3)

(1) UNESCO-IHE Institute for Water Education, Delft, The Netherlands

(2) Public Research Center – Gabriel Lippmann, Luxembourg

(3) Water Resources Section, Faculty of Civil Engineering and Geosciences, Delft University of Technology, The Netherlands

(d.solomatine@unesco-ihe.org)

One of the ways to increase the accuracy of hydrologic models is to build several models and to try to combine them hoping that the resulting aggregate would be more accurate. There are several ways of doing this; two most important can be mentioned. One option addresses the parameter uncertainty: since it is difficult to identify one ideal set of parameters, several models can be built with different parameters sets, and their results combined comprising a so-called ensemble.

Another approach is to assume that it is possible to build and calibrate the single model, i.e. find the optimal parameters set. However, if such model, being on average accurate, tries to cover all possible hydrologic conditions it may not be showing the optimal performance for some of these conditions. In this case several models can be built, each of which would be "responsible" for a particular condition. In operation, typically only one model is used, the one that matches the best the observed hydrologic load. Such models are called modular. A third option, intermediate between ensembles and modular models, is to use a "soft" weighted combination of the most relevant models; it is referred here as a "fuzzy committee".

This work concentrated on investigating various combining schemes for such modular models. A modular hydrological model is built (where the modules are the HBV models). Among the various hydrologic conditions that can be considered, we focused on those relating to the high and low flows or rainfalls.

The performance of the model can be judged on the basis of several criteria, for example, RMSE or index of volumetric fit. Algorithms of multi-objective optimization were used to identify the parameter sets that would ensure good performance with respect to the several criteria.

The soft combination of models was tested on the data from a European catchment. The obtained results show that such approach leads to increase of accuracy of the resulting model.