Geophysical Research Abstracts
Vol. 14, EGU2012-4039, 2012
EGU General Assembly 2012

Multi-purpose calibration of HBV models for the Rhine with OpenDA

W.J van Verseveld (1), F. Sperna-Weiland (1), D. Meissner (2), H.C. Winsemius (1), A.H. Weerts (1), S. Hummel (1), J.H. Sumihar (1), and M. Hegnauer (1)

(1) Deltares, P.O.Box 177, 2600MH Delft, The Netherlands, (2) Bundesanstalt für Gewässerkunde, P.O.Box 200253, 56002 Koblenz, Germany

Calibration strategies for hydrological models nearly always depend on user interests. These interests are strongly determined by the eventual practical application of the model: what information should the model primarily provide, e.g. low flows, high flows, or accumulated inflows; what spatial and temporal information density is available in terms of data, and what information needed in terms of practical use; should parameter uncertainty estimation of the hydrological model be included?
The Open-source Data Assimilation toolbox (OpenDA) is an open software framework for calibration and data-assimilation of hydrological models. In this contribution, we show that OpenDA can be used to rapidly calibrate a hydrological model, which is to be used for different purposes or under different circumstances such as mentioned above. To this end, OpenDA includes a number of calibration algorithms, can communicate with a multitude of hydrological and hydraulic models, and can handle multiple calibration signals in one calibration experiment. It can therefore be employed in complex calibration experiments. New algorithms and models can be included efficiently in the software.
Our case study focuses on an HBV model structure for the international Rhine basin (area $\sim$ 185.000 km^2), consisting of 134 sub-catchment units containing many different gauging stations. This model is embedded in Delft-FEWS, an operational forecasting system which can also be used for offline data management and model integration. We performed a recalibration focussing on two applications:

• FEWS-Rivers / FEWS-BfG (operational forecasting): Simulations of snow pack and melt within HBV performed poorly in this application. The model was optimized on hourly time scale. Parameters, related to snow processes were identified and optimized on a large number of available gauge data sets, using the Shuffled Complex Evolution algorithm.

• FEWS-GRADE (extreme discharges for dike design): In this application, very long synthetic discharge series are simulated on a daily basis. Because of the high return periods of interest (1/1250 years), uncertainty of these estimates should be taken into account. Therefore, calibration has been performed using the GLUE algorithm. GLUE is used to select an ensemble of parameter sets, rather than one single set. Parameter performance was tested with specific criteria for extreme high discharges.