Geophysical Research Abstracts, Vol. 9, 01811, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-01811

Generic error model for calibration and uncertainty estimation of hydrological models

J. Götzinger, A. Bárdossy

Institute for Hydraulic Engineering, University of Stuttgart, Germany
(Jens.Goetzinger@iws.uni-stuttgart.de / Phone: +49 711 685-64778)

Hydrological models are frequently used for forecasting, water management or design, i.e. to provide information for decision making. Due to the necessary simplification of the complex natural processes and the limited availability of observations these models cannot perfectly describe all elements of the hydrological cycle. In order to consider the uncertainties in decision making the modeling uncertainties resulting from this generalization have to be quantified. In this contribution the model error is quantified using a combined procedure. For the uncertainty of discharge due to meteorological input a stochastic simulation method is used. To quantify the effect of process representation and parameterization a sensitivity analysis is carried out. It is assumed that the model error due to process uncertainty is proportional to the sensitivity. The final model error variance can thus be calculated from the stochastic errors and the process sensitivities. The coefficients used for the quantification are estimated simultaneously with the model parameters.

The presented methodology produces error series which are representing the varying importance of different processes in time and are normally distributed. This uncertainty time series can be used as a weighting factor to normalize the model residuals during calibration so that the assumptions of least squares optimization are fulfilled. Calibration and uncertainty estimation are demonstrated by an example application to a distributed HBV model of three watersheds of the Neckar basin in South-West Germany. The model residual distributions are presented and compared to a standard calibration method. Further, it is shown that the new methodology leads to more realistic confidence intervals for model simulations. Although applied to the HBV model as an example, the method is general and can be applied to any model also in conjunction with other uncertainty estimation techniques.