Geophysical Research Abstracts, Vol. 9, 04339, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-04339

Half-automatic calibration of WaSiM-ETH by using the genetic evolution algorithm SCE-UA

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Within the Project HORIX the spatially distributed and physically based hydrological model WaSiM-ETH is used for modelling flood events. As is generally known the successful application of such a model depends on a good calibration quality, which normally requires a detailed model understanding and further depends strongly on the user's experiences. Moreover, because of the nonlinearity of the processes and model characteristic, it is typically difficult, if not impossible, to obtain a unique set of parameters. Model uncertainties are implied additionally to the uncertainties due to the input data.

To overcome the inadequacy of a manual calibration the genetic evolution algorithm SCE-UA (Shuffled Complex Evolution - University of Arizonas, Duan et al., 1992, 1993, 1994) is applied. The algorithm itself is leaned on the natural biological evolution process and includes combinations of random and deterministic approaches, the concept of clustering and systematic evolution as well as the concept of competitive evolution. Due to this combination of concepts the optimization will not stuck within a local optimum, but will find the global optimum and therefore makes the calibration more evenhanded.

However, before the application of the SCE-UA algorithm it is advisable to do a parameter sensitivity analysis. With the results of such an investigation it is possible to define the n-dimensional parameter space more precise, which consequently reduces the computational time of the optimization. In this case the General Sensitivity Analysis (GSA) based on Monte Carlo Simulations (Wade et al., 2001) has been carried out.

This presentation discusses to what extent it was possible to calibrate the WaSiM-

ETH model for the Upper Main river basin and how far uncertainties, mainly coming from the measured input data, influence the calibration results. Further it shows to what extent the knowledge of the parameter sensitiveness due to the GSA analysis can be used for the half-automatic model calibration. In addition a short outlook over the up-coming work with respect to the uncertainty analysis and the fuzzy-based flood forecasting expert system will be given.