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Ensemble hydrologic predictions through automatic watershed model calibration

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The present study is concerned with the application of automatic optimization method to calibrating physically-based distributed hydrologic model parameters. The optimization algorithm Shuffled Complex Evolution Metropolis (SCEM-UA, developed in collaboration between the universities of Arizona and Amsterdam) is applied to the hydrologic model GEOtop 0.75 (developed in the university of Trento, Italy) and to the basin Mandola, Trento, Italy. The conditions and limitations of the experiments have been explained. Under such conditions, the parameter estimation process has been performed for the four important parameters and hence, the most (achievable) probable parameter set has been found. To verify the trueness of such a calibration process, two validation experiments have been done for the two successive periods. Introducing the final soil moisture (simulated by the model) at the end of the first period, to the next simulation (as the initial soil moisture condition), the behavior of the model in this point of view has been examined and discussed. Upon such calibration and validation experiments, the evolutions of posterior pdfs for the four parameters, as well as the situation of convergence of objective function, have been assessed and discussed. The important fact of globalizing the random search has been experienced and discussed. The predictive uncertainty estimation has been done through ensemble hydrologic predictions.