

Reza Entezarolmahdi

Parameter estimation for hydrologic models

Abstract of the doctoral thesis

Supervisor: prof. Riccardo Rigon

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, University of Arizona (SCE-UA), [Duan et al, 1992, 1993 and 1994], has firstly been applied to the gray box model Nash Instantaneous Unit Hydrograph (IUH), [Nash 1958].

Afterwards the optimization algorithm Shuffled Complex Evolution Metropolis (SCEM-UA, developed in collaboration between the universities of Arizona and Amsterdam), [Vrugt et al., 2003], has been applied to the hydrologic model GEOtop 0.75 (developed in the university of Trento, Italy, [Bertoldi and Rigon, 2004], 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. Such 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. The alternative to solve the observed problems, in this sense, has been introduced briefly. Upon such calibration and validation experiments, the evolutions of posterior pdf(s) 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.