



On the practical use of multiobjective optimisation in hydrological model calibration

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In the last decade, the application of multiobjective optimisation algorithms in calibrating hydrological models has become increasingly popular. This approach enables for generating a number of Pareto- optimal parameter sets on the basis of multiple criteria, usually expressed by means of statistical fitting functions on observed data. Since the focus was given to the algorithmic handling of the problem, less attention was paid on some critical practical issues, regarding the selection of criteria and the identification of acceptable compromises among the vast number of non-dominated solutions. These are revealed by means of real-world examples, involving models of different levels of complexity. We provide some practical guidelines to take advantage of the hydrological experience, in order to enhance the information contained in calibration, thus ensuring consistent and reliable models. In this context, we emphasise on the incorporation of the so-called "soft" data within calibration, which characterise the qualitative rather than the quantitative knowledge about the behaviour of the hydrological system. This allows for evaluating the model performance against a number of responses and internal variables that are not controlled by measurements. Moreover, we attempt to treat the concepts of equifinality and Pareto optimality, as two complementary approaches to the parameter estimation problem. Finally, having determined a representative set of non-dominated solutions, we examine strategies for selecting the best-suited one and recognising ill-performed calibrations, which are due to either structural or data errors.