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A proposal for a hierarchic method of calibration for hydrological simulation

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The need for calibration of hydrological numerical models employed for flood monitoring/forecasting is becoming increasingly important as the evaluation of flood risk is widely recognized as one of the main issues in the natural hazard losses assessment. More complex models, though, especially distributed, complete physics models, require complex parametrizations and consistent amounts of computational costs to be properly calibrated, whichever optimization algorithm is employed. In general, in fact, a typical approach consists in evaluating several values of the cost function for different combinations of parameters values, that requires as many computational-demanding simulations, especially if the calibration period is long. In this work a simple rainfall-runoff model, with lumped parameters, is employed to explore a novel approach for calibration. The proposed hierarchic method consists in initially employing only a small part of the observations for the calibration process, thus obtaining a first set of "sub-optimal" parameters values. Then, as the values of the parameters converge, more observations are added in order to obtain more generally-valid parameters. For instance, in the case in which several years of observations are available, the first calibration could be made by using only one seasonal cycle, then two, three or four, and so on. The advantage of the method is that, for each iteration, it performs a minimum search starting from a "better" initial condition, because the latter was obtained by the previous optimization step, and the main exploration is performed at the first step, in which the evaluation of a single value of the cost function is minimized. The results of the algorithm are presented in comparison with the performance of a more classical approach with the same cost function and the same minimization algorithm.