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Hydrology and Earth System Sciences Discussions

Interactive comment on "Reply to J. Vrugt's comment on "How effective and efficient are multiobjective evolutionary algorithms at hydrologic model calibration?"" *by* P. Reed et al.

Anonymous Referee #3

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The main comment made by Dr. Vrugt to the paper by Tang et al. (2006) is related to the initial sampling strategy employed in the comparison of the optimisation algorithms. He refers to some of his own work (Vrugt et al., 2003) where it has been demonstrated that the efficiency of the Multi-objective Shuffled Complex Evolution Metropolis (MOSCEM-UA) algorithm can be significantly improved by using an alternative sampling strategy. I find that this is an important issue in relation to the evaluation of optimisation procedures. However, in relation to the work by Tang et al. (2006) I don't think this will have any major impacts on the general conclusions from their study (although this is, of course, speculative). An alternative sampling strategy as suggested by Vrugt et al. (2003) would be interesting to analyse, but in this case should be used in all

three algorithms to make a consistent and fair comparison. And since the alternative sampling strategy by Vrugt et al. (2003) basically reduces the size of the hypercube where the initial population is drawn, one would expect that this would have the same impact on the performance of all three algorithms.

Still, one can discuss if the comparison is 100% objective and fair. Optimisation algorithms include different parameters that can be tuned to optimise their performance. Experience in the use of a particular algorithm thus has an advantage when doing comparative studies and hence could bias the outcome of such analyses. In the reply to the comment by Dr. Vrugt, Dr. Reed and co-authors emphasize that both the SPEA2 and MOSCEM-UA algorithms were tested for different algorithmic parameter settings in order to maximise their performances, Thus, in this regard I find that Tang et al. (2006) have adequately addressed the problem of comparing an algorithm that they have developed with other algorithms that they are (probably) less familiar with.

Still, another issue could be commented on. In their reply, Dr. Reed and co-authors emphasise the strength of the epsilon-NSGAII algorithm in the use of dynamic epsilon-dominance (ED) archiving. This is a pre-conditioning of the search, which is different to starting the search from a randomly generated large population that is included in the other two algorithms. Indeed, this form of pre-conditioning has similar features as the sampling strategy proposed by Vrugt et al. (2003). It would be interesting to compare the effect of the different pre-conditioning approaches on the performance of the optimisation algorithms. I'll leave this exercise to be considered by Dr. Vrugt and Dr. Reed.

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Interactive Comment