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Hydrology and Earth System Sciences Discussions

Interactive comment on "DREAM$_{(D)}$: an adaptive markov chain monte carlo simulation algorithm to solve discrete, noncontinuous, posterior parameter estimation problems" *by* J. A. Vrugt

Anonymous Referee #3

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Review comments for 'DREAM(D): an adaptive markov chain monte carlo simulation algorithm to solve discrete, noncontinuous, posterior parameter estimation problems.'

In summary, this paper discussed the improvements the author has made on the initial DREAM in order to handle discontinuous parameters optimisation problems. I am unsure whether the improvements here can be counted as a genuine research contribution. However, I will leave this to the editors to determine.

My specific comments are

Page 4031, Line 19 mentioned that the samples are drawn from a prior distribution.

Are the limits for the prior distribution required to be wide in order to provide a good sampling range? It is known that for a single chain MCMC, identifying the prior is important so as to ensure that the Markov chain will not be trapped in a local mode. While this may not be the case with DREAM(D), since it runs with multiple chains, whether the nature of the prior will eventually influence the simulation, is something the author needs to discuss and elaborate on.

Page 4035, Line 25 again mentioned prior distribution. Are these priors the same for both the cases considered?

Page 4038, Line 10 mentioned that the parameters are equally distance. Does it mean that N is fixed and what are the possibilities of increasing or reducing N? Is DREAM(D) sensitive to the changes in N? It was noted that DREAM(D) algorithm depends on d for the evolution processes, hence by increasing d, will it have a major influence on the overall hydrological simulation? Has a sensitivity analysis between d and N carried for DREAM(D)?

Additional comment: I am not sure whether the case study using SUDOKU is appropriate for inclusion in this present example. If the aim of the author was to assess hydrological case studies where variables assume discrete values, the author may want to look up the significant literature on specifying rainfall occurrence generation models where the variables are discrete (0 or 1).

Page 4030 line 14 makes a fairly generic statement on this algorithm being the only one available that can solve parameter estimation problems where the parameter is discontinuous. The author should look up work in settings where discontinuous variables are needed – such as the rainfall work mentioned, and then comment. While I do not have a reference with me, I do not see any issue with any MCMC sampling algorithm being modified to work with discontinuous variables, as long as the sampling distribution is sensibly selected.

Page 4030, Line 17 mentioned that Section 2 presents a short introduction to MCMC

but it is not mentioned in Chapter 2.

Page 4032, Line 8. The author needs to better explain what is meant by the CR in the algorithm, and whether this is something that is new in the paper or adapted from prior research.

Page 4036, Line 10. Error in the sentence: ‘This results in a discrete The posterior . . .

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 4025, 2011.