RC2: 'Comment on hess-2023-233'

General Comments:

Thank you for giving me the opportunity to review your paper. From my understanding, the main aspect of this paper is “Dynamic Parameter Updating.” The method uses different parameter values over time based on the changing land cover. The parameter values are updated from the same look-up table at each flood event based on the land cover present at the event.

I recommend rejection as I do not believe the methods shown are novel enough to solicit publication in HESS. I believe that comparing Particle Swarm with other algorithms has already been done many times. I recommend going beyond a simple case study to better prove your lookup values are applicable to other urban catchments, or by adding more algorithms to compare against.

General Reply:

Dear Reviewer, thank you very much for your efforts to review our paper. We are very sorry that you do not give our paper a positive comment. We would like to mention that comparing Particle Swarm with other algorithms is not the purpose of this study, we only employed this algorithm to optimize the model parameter. The novelity of our paper is that we found that the model parameters of distributed hydrolgocial model is in changing with land use/cover change, i.e., the model parameter has dynamic characteristics. And we have proven this dynamic’s existance, and the model parameter could be updated with the changing land use/cover. And we also find that the model parameters are LUCs stationary. Based on the literature review, no this kind of study has been published. We think the findings are novel and has its values.

We revised our paper based on your comments and another reviewer’s comments, following are point-by-point responses to your comments. We finally hope you could change your mind. But unfortunately the revised manuscript could not be uploaded due to the Jounal’s rule, but in the reply to another reviewer, we attached the major revision parts.

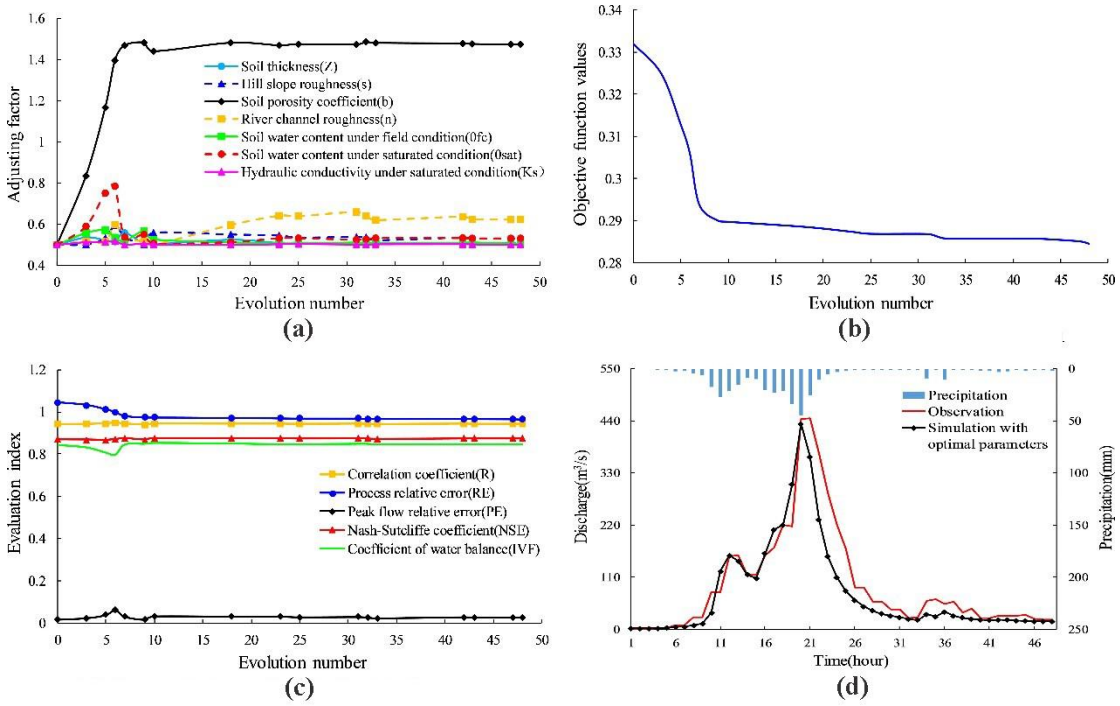
Many thanks.

Yangbo Chen, on behalf of all authors

Major Comments:

R1-C1. Can the figures be added in line with more descriptive captions? This seems minor but can deter readers from wanting to read your content if they cannot find your figures easily. I had to open two tabs when reviewing this, one for figures and one for the text, as I didn't want to lose my spot when reading.

AC1：Thank you for your reminder. As it is in the reviewing stage, so the figures are not put in the appropriate location. But after it is accepted, this problem should not exist anymore. Thank you for your suggestion, we revised Figure 7 (now Figure 8), add some explanatory words, so it is more readable.




**(a)** The evolution of parameters. Most parameters are assigned good initial value, except soil porosity coefficient, but it converged to the optimal value.

**(b)** The evolution of objective function. In this study, the objective function is to minimize the Mean relative error.

**(c)** The evolution of statistical indicators. 5 indices are employed.

**(d)** Simulation (20080625). Simulation result with optimized parameters and and the observed hydrograph.

Fig. 7 results of parameter optimization

R1-C2. Line 282-283: Is there a citation for the referring look-up values?

AC2：Thank you very much, dear reviewer. Two reference is cited (Chen et al, 2011; Chen et al, 2016), which is already in the reference list.

R1-C3. Lines 293-296. Can you better describe the initial values and the process that the Liuxihe model uses to attain them? This would benefit the reader as you refer to

these metrics heavily in your paper, say they are, “experience-based,” but don’t provide a method to calculate them/reproduce them.

AC3：Thank you very much, dear reviewer. In the references, there are detailed descriptions on how to determine these values. To avoid duplication, Line 281-291 already briefyly described this issue.

R1-C4. Line 377: Is there a citation on why PSO is effective with getting parameters and is “proven effective” when only using one flood event? Given the small amount of flood events used or parameter calibration, there is a chance that parameters are overfit

AC4：Thank you very much, dear reviewer. PSO is proposed for optimizing Liuxihe model parameters in 2016(Chen, Y., J. Li, and H. Xu, 2016. Improving flood forecasting capability of physically based distributed hydrological model by parameter optimization. Hydrol. Earth Syst. Sci., 20, 375-392. https://doi.org/10.5194/hess-20-375-2016). Then, dozens of studies have proven that hydrological data from only one flood event is needed to optimize the model parameters, which is different from the lumped hydrological model. There is no finding that overfit exists as the simulation to all other observed flood events are samely well. There is no problem of overfitting, the main reason is that distributed hydrological model has physical meaning, including the rainfall-runoff production and routing process, and the parameters.

R1-C5. Line 430, 436: Can there be a simpler flood naming convention? Using a long name with little formatting, parameter-20080625-2008, seems complex. Perhaps calling it Parameter set A, and then have a look-up table that maps your set letter to your dates. Using parameter-20080625-2008-updated could be called Parameter set B.

AC5：Dear reviewer, many thanks for your suggestion. This will cause new problem, i.e., the parameter set has no implicit connection with the flood event, which is emphasized in this study. For this reason, after a carefull consideration, we think it is better to maintain its current format. But anyway, think you very much for this suggestion.

R1-C6. The following comments are for Figure 6: a. For panel (a), what is the adjusting factor? b. For panel (b), what is your objective function? This is not described in the paper. c. For panel (c), it looks like your evaluation metrics (R, NSE, etc) start extremely close to their final values (after evolution 50) d. For panel (d), Can you provide a simulation with initial parameters as well? Based on the slight changes in metrics over all 50 epochs, my hypothesis is the initial parameters hydrograph would look very similar since your metrics in panel (c ) didn't vary much. A suggestion would be to compare the percent error of the initial simulation vs observations and the optimal parameter simulation vs observations. If your routing timing, and flood matching is more stable (closer to 0) after PSO, you can state that your optimal solutions are of a good fit. e. Line 391-394: You stated that because there was good fitting, the PSO algorithm worked. Can you add a quantitative metric/comparison with initial values to better show this?

AC6：Many thanks dear reviewer for your carefull review, below are point-by-point replies. Now Figure 6 becomes Figure 7 in the revised manuscript as shown above.

a. Adjusting factor is a coefficient adjusting the initial parameter value. During the optimization process, this factor changes, and finally reaches the optimal value. Simply, it is the ratio of the optimized parameter value with its initial value. For different parameter, this factor is different.

b. The objective function employed in this study is minimizing the Mean relative error.

c. Yes, you can say so. The reason is that after many year experiences in Liuxihe model parameterizaton, we have very good skill in determining the initial parameters. But there is exception in this study, initial value of the parameter of soil porosity coefficient is not so good, but finally with the optimization, the optimal value is found.

d. Please see Figure 8 (now Figure 9), there are comparisons among observation, simulation with initial parameter, and optimized parameters.

e. Please see "4.3 Effect of parameter optimization on model performance", and Figure 8 (now Figure 9), table 6.

R1-C7. Line 461: Are the initial parameters the ones used in Section 4.1, or the parameters generated from PSO at parameter-20080625-2008?

AC7：Yes, the initial parameters are the ones used in Section 4.1.

R1-C8. Figure 8: Can this figure be reworked? The text is very small/un-readable in the middle figures, and the precipitation varying with time change is hard to see.
AC8：Figure 8 (now Figure 9) is clear shown in my computer, so it is not redrawn. But if this paper could be accepted and published in HESS, and the editor find it is also needed to be redrwan, we certainly can do it.

R1-C9. For the conclusions, I'm not convinced by Conclusions 3, and 5. There was no experiment outlined for how the PSO algorithm was run, and if the data was overfit or not (only results were shown in Figure 6). Furthermore, the initial lookup table is based on "current experiences," which are not mentioned in this paper. Conclusions 3 is obvious based on the results of this study. Conclusion 5 has been proposed in the PSO reference and several applications, in this study, it is only be strenthened, particularly in the urbanizing watershed.
AC9：PSO algorithm for Liuxihe model flood modeling has been published in HESS in 2016 (Chen, Y., J. Li, and H. Xu, 2016. Improving flood forecasting capability of physically based distributed hydrological model by parameter optimization. Hydrol. Earth Syst. Sci., 20, 375-392. https://doi.org/10.5194/hess-20-375-2016), there are detailed description to this algorithm and its robustness has been proven in this paper, it is not the purpose of this paper to do it again.
The initial lookup table is based on the land use/cover type, it does not matter if it is based on "current experiences" or "past experiences", as they will be optimized, this does not change conclusion 3.
Conclusions 3 is obvious based on the results of this study, it is the purpose of this study. We think conclusion 3 is in no doubt.
PSO algorithm is not the key topic of this study. To make it clear, we revised conclusion 5 to as "This study provides more cluse to prove that parameter optimization is effective and needed in controlling parameter uncertainty for physically based distributed hydrological model.", or it may also be removed.

Minor Comments:
R1-C10. Line 163: The number 6 should be written out as a word, six.

AC10：Good comment, changed, thanks.

R1-C11. Figures 2, 4: Is there a better way to highlight the LUC change without having four similar basin plots? I can't really tell the difference between any of the yearly changes.

AC11：Good comment. Yes it is not easy to recongnize the difference by eye, it is for this reason, we add text following Figures 2 (Line 180-183), point out that the urban land area in 2008, 2011, 2013 and 2015 respectively, as urban land area is the most significant land use type.

For Figure 3, in Line 185-194, highest, lowest and mean elevation are listed, and 4 soil types percentages are also listed. These are good supplement to the information of the Figures.

For further information of Figure 4, line 523-534 provides more information.

We think these are good options, and some important information are presented clearly.

R1-C12. Line 306, 376: You already defined PSO, no need to redefine it.

AC12：Good comment, changed, thanks.

R1-C13. Line 376: There needs to be a space inserted between Optimization and the (

AC13：(PSO) deleted based on your previous comment, so this issue does not exist anymore, but anyway, thank you.

R1-C14. Line 376: It's Particle Swarm, not Particle Swam. This needs to be corrected in a few places.

AC14：Good comment, changed, many thanks.

R1-C15. Line 376: What algorithm/coding package was used for PSO?

AC15：no coding package, but Java is employed to write all the original code by ourself, which is embedded in the Liuxihe model software.