

Interactive comment on “Inverse modeling of hydrologic parameters using surface flux and runoff observations in the Community Land Model” by Y. Sun et al.

Anonymous Referee #2

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The paper “Inverse modeling of hydrologic parameters using surface flux and runoff Observations in the Community Land Model” analyzed the impacts of different observation, temporal resolution and parameter reduction on parameter optimization results following the previous sensitivity work. These works are important for the CLM community to realize and improve this model in detail. Authors have done amount of simulations. I think there are still some major concerns before it can be accepted for publication.

Major:

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1. The vegetation parameters such as leaf area index, VcMax are very important to the surface fluxes simulation. Have you considered the effects of these parameters? For example, CLM4 use low VcMax values compared to the measured ones, this will result in low latent heat flux.
2. The soil texture also affects the soil evaporation, this also contribute to the fluxes. Compared with the parameters used in your study, are these parameters more sensitive to fluxes or not? I think these vegetation parameters and soil texture should be discussed.
3. Page 17, second paragraph. The LH in Fig. 4 is better than that of Fig. 10. And the runoff in Fig. 8 is better than Fig. 12. How can you get the conclusion of “Overall, inverse modeling with a reduced set of parameters identified from previous sensitivity analysis shows some small improvements in simulating heat flux compared to using the posterior results with ten parameters”? With less parameters involved in the optimization, you can not obtain the improvements, the results are not consistent with your finding. Also in page 17, line 19-21, the conclusion is not consistent with your results.
4. Page 4, “we adopt and compare the performances of two different inversion strategies, including deterministic least-square fitting and a stochastic Bayesian inversion approach integrated with Markov-Chain Monte-Carlo (MCMC) sampling”. But from the paper, I can not find the results of least-square fitting. Right?
5. Can you discuss more about: impact of optimized parameters using fluxes on the runoff or the impacts of optimized parameters using runoff on the fluxes? It is interesting that whether you could get contrary conclusion or not. If the findings are contrary, which observation can be used in the calibration?

Minor:

1. CLM is used to model the runoff. Usually the land surface model is not good choice

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in the runoff simulation for a small basin. Can you explain more about this? Whether it is reasonable or not?

2. Page 12, line 26. "the posterior estimates of parameters all significantly improve the heat flux simulation in summer", I think the improvement is not significant in summer from Fig. 2.

3. Page 13, line 1, what is "Gaussian probabilities of misfits between calculated and observed responses", please add more explanations.

4. Page 14, last paragraph, there are no results to support this section. Because you don't provide the daily results of US-MOz. Same as Page 15, the last paragraph.

5. What is the reason of large fluctuations in Fig. 8 with optimized parameters? Can you explain?

6. I think it is better to measure the runoff performance using NSE, not RMSE.

7. I suggest to add the daily results of US-MOz, because you cite these results many times.

8. Page 20, line 22, I think the surface heat flux could have large day-to-day variability due the change of soil moisture condition

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