



EGUsphere, referee comment RC1
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Comment on egusphere-2022-406

Anonymous Referee #1

Referee comment on "Point-scale multi-objective calibration of the Community Land Model (version 5.0) using in situ observations of water and energy fluxes and variables" by Tanja Denager et al., EGU sphere, <https://doi.org/10.5194/egusphere-2022-406-RC1>, 2022

I enjoyed reading this elaborated work on a sophisticated energy balance land surface model CLM5. It is well written and organized. Evaluating such complex model at hourly time step and at multi objective manner with Tikhonov regularization approach is novel as Tikhonov regularization has been usually applied in groundwater water models.

Specific comments:

Recent literature on spatial calibration of LSM is missing from Introduction section.

Some examples are as follows:

-P2 Line 25 or 31, a small scale hydrologic study on spatial calibration using RS products can be included (doi:10.5194/hess-22-1299-2018).

-P2 Line 26 FLUXNET, doi: 10.5194/hess-21-5987-2017

-P2 Line 28, doi: 10.1029/2020WR028393

-Page 7 Line 11: "1000 years" please explain how?

-P7L14: "final simulations" why only before final simulations and not during calibration?
Please explain more..

-P8L5 to11: this paragraph should be moved to the section 2.3 describing calibration approach to avoid repetition.

-P8L27: "Focus was given to a set of 30 time-invariant model parameters." Apparently no sensitivity analysis was applied? Why?

-In a calibration framework it is essential to apply SA first to reduce search dimension. May be some of the 30 parameters have zero influence on the objective function? Did you utilize PEST's local sensitivity analysis option?

-Section 2.3: The reader can be curious about several details of the calibration framework.

1)what was the user defined maximum number of iterations for such a sophisticated mode?

2)computer runtime statistics and cluster properties (logical processors, ram capacity, intel/amd etc)

2)Pest has three search algorithms LM, SCE-UA and CMAES. Can "Tikhonov regularization" be used together with one of these search algorithms?

3) sharing PEST control file ".pst" in appendices (or supplementary) can be good for this open access journal.

-only eq 10 is bias insensitive metric. Why the authors did not choose a spatial metric focusing on patterns of fluxes in growing season? Evaluating hourly (unstable) fluxes can be misleading. Instead evaluating monthly patterns of SWC, AET, SM can be a robust guide for the model. Fig 2-3-4 are showing only temporal aspects of the fluxes/states but this kind of finite element based LSMs can provide maps outputs. The authors should show also some map results. Looking at only time series can be boring.

-why Pareto approach was not used for multi-objective calibration to avoid dominating solutions. Pareto DDS algorithm (available in Ostrich) could offer multiple non dominating solutions. PEST doesn't include this algorithm yet.