

Interactive comment on “CH₄ parameter estimation in CLM4.5bgc using surrogate global optimization” by J. Müller et al.

Anonymous Referee #1

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The authors make use of a surrogate optimization approach for calibrating the parameters of the methane module of the Community Land Model (CLM). The model prediction capabilities are improved via the use of surrogate models given only a few measurements. The most important parameters in the model are tuned in order to solve the optimization problem. The paper is well-organized and presented but, there are a few things to be addressed prior any acceptance:

1. The number of function evaluations will be high for high-resolution models. How your method faces this challenge? 2. The expensive evaluation at step 5 in Algorithm 1 should provide a different value even for the same vector x_{new} , this is because realistic models are able to reproduce different results for the same input vector in different runs (the results are similar but they are not exactly the same one) Are there

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any problems in the use of realistic models in this step? 3. According to this: “the matrix in equation 8 is invertible if and only if $\text{rank}(P) = d+1$ ” Whenever this is true, how do you guaranty that this matrix is well-conditioned? Is it based on the set of basis Φ , what about having a degenerated basis? Another question from this, if I have a problem with 80 parameters in a model whose resolution is 10^7 (an atmospheric model can easily reaches this dimension) should I run the model 81 times per iteration? Seems to be a quiet expensive. Should be nice to have a subsection discussing these points.

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