

Interactive comment on “Calibration of a multi-physics ensemble for greenhouse gas atmospheric transport model uncertainty estimation” by Liza I. Díaz-Isaac et al.

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Report on "Calibration of a multi-physics ensemble

This is a significant study and is appropriate for publication in ACP. However there are a few places where the terminology could be clarified.

Overall, I think the term "selection" or "down-selection" is preferable to "calibration" for the process that is being used.

Also, in many places, it would be better to replace "errors" with "uncertainty" (i.e. statistical characterisation of the unknown errors).

C1

The flatness of the rank histogram is the primary criterion for selecting the ensembles. What doesn't seem to be discussed is the significance of various departures from flatness (as a function of the numbers of bins and the number of samples in the histogram). What fraction of the roughly 8 million possible 6 member ensembles (from the 45 cases) have essentially the same flatness. It is these questions that need to be clarified for understanding of whether the different results from SA vs GA are selecting from different populations of near optimal cases, or whether the differences are pretty much what you would expect from statistically based optimization on a population with a very flat minimum.

However, what I don't understand about the SA and GA searches is "why bother". Why not just look at all the cases explicitly (About 3 billion for the 10 member ensembles).

For M observations, all you need is a 45 by M table of the p_i (i.e. deviation between model and obs).

Then generate each sub ensemble in turn. For each case you scan the table and for each of the 45, you count the number where that model is part of your current sub ensemble AND p_i is less than zero. This number tells you which bin to increment. After dealing with all M observations, calculate delta and J . As you work through all 3 billion possible sub ensembles, keep track of the best J (and note which ensemble) and any other statistics that you want.

This looks like it is well within the capabilities of modern computers.

For many purposes, there is no need to store stuff about all 3 billion ensembles, but if you wanted to, you could store all the J values in about the same amount of memory that I have on the sd card in my low-end smart phone.

As a minor point of notation, the ensemble, defined as a set, S , is indicated by upright font when it is introduced (p8, L27) but is shown as a slant font (as used for algebraic variables) as is done on the next line, and in eqn 3 and most later places. The usage

C2

should be made consistent. Also, subscripts that are words or abbreviations of words, upright font should be used.

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2018-1117>, 2018.