Geoscientific
Model Development
Discussions

Interactive comment on "Auto-calibration of a one-dimensional hydrodynamicecological model (DYRESM 4.0-CAEDYM 3.1) using a Monte Carlo approach: simulations of hypoxic events in a polymictic lake" *by* Liancong Luo et al.

Anonymous Referee #1

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This paper uses a Monte Carlo Sampling (MCS) method to auto-calibrate a hydrodynamic ecological model. This is perhaps the first application of MCS method for auto-calibration a hydrodynamic lake ecosystem model, and thus, the study is providing new concepts/methods. The paper is well organized, and the methods are valid, as backed up by their use in the calibration of other types of models. The results are discussed in an appropriate and balanced way, the discussion comparison to the Burger et al (2008) paper is very useful for putting this method in context. The method presented definitely has the potential to lead to significant scientific results. For example, if future use of hy-

drodynamic ecological models are able to incorporate these methods, the researchers can spend more time doing the science instead of tedious trial-and-error calibration. A very valuable part of the paper will be the code for auto-calibration, so that other researchers may modify to fit their own needs and application. There are a few areas that need more explanation (see "specific comments" below) in addition to some typing errors (see "technical corrections" below).

Specific Comments

5:21 how was it determined that the model output was not sensitive to the parameter? Please describe with at least a little more detail in the text. What is the threshold you used for if a parameter is sensitive or not?

5: 27 "An alternative approach is to enter the physical parameters manually as many of these parameters can be fixed on the basis of their theoretically constrained values." Why do you provide the alternative approach here? This statement sounds more appropriate for the introduction or discussion. Are you saying the auto-calibration isn't really necessary for the physical parameters? Please explain more, or move to intro/discussion.

5:35 What were the weighing factors? What where they based on? (then possibly in Discussion: Would your results change if the weighing factors were different?)

5:22 Table 3 has a stoichiometric parameter (Stoichiometric ratio of C to O2 for respiration); yet on line 5:21-23 you state: "When the model output was not sensitive to the parameter or when fixed parameter values could be used (e.g., stoichiometric parameters), the minimum and maximum value were set to be equal and the parameter calibration was deemed unnecessary." Can you explain why you calibrated this particular stoichiometric parameter in your method? Or, be more clear about for which parameters calibration is not necessary. Can you provide a table of all parameters (including ones that were not auto-calibrated) in the supplementary document? Useful columns would be: parameter name and unit, parameter value, indication of if the pa-

rameter was auto-calibrated or not, if parameter was not auto-calibrated provide a very brief description of why parameter was not auto-calibrated (e.g. deemed not sensitive in sensitivity analysis, fixed parameter based on literature/theory/etc.)

11:5 Change "massive parameters" to "a massive number of parameters" and maybe replace "massive" with a more quantifiable measure? Also: change "dynamic water quality model" to either "a dynamic water quality model" or "dynamic water quality models." Also: add "calibration of" to "...effective method for [calibration of] dynamic water..."

11:9 Did you quantify the "time-consuming" part of this conclusion? Perhaps be a bit more descriptive in the extent to which you know it is in fact

Technical Corrections

Equation 1 and 2 have an undefined Q variable.

Figure 2 needs a color ramp scale/legend

Figure 1 is referred to in text as "Figure 1" whereas Figure 2 is referred to in text as "Fig. 2" –should be consistent in abbreviating or not with in text figure references.