RESPONSES FOR GMD-2022-303

Title: *Recalibration of a three-dimensional water quality model with a newly developed autocalibration toolkit (EFDC-ACT v1.0.0): how much improvement will be achieved with a wider hydrological variability?*

June 28, 2023

Dr. Jeffrey Neal
Topic Editor
Geoscientific Model Development

Dear Jeff,

We highly appreciate you for reviewing our manuscript and giving valuable suggestions. The comments of the editor for the insightful and constructive recommendations are good for improving the quality of our manuscript. In the following pages are our main corrections to the manuscript and responses to the editor comments as points to points.

We have read the comments of the editor carefully and revised the manuscript to improve the formal scientific presentation and to make the code and data availability section consistent with the relevant GMD policies. Firstly, we rewrote sentence of the abstract to make it closer to the topic of the manuscript. We also rephrased the opening section of the third paragraph in the introduction, which is now more concise and clearer. We were very caution for the code and data availability section and revisited GMD's code and data policy. Based on the policy we have again collated the datasets that can be shared publicly and archived it on the public repository Zenodo. For water quality datasets that cannot be publicly available, we have given clear explanations (for public health purposes) and shown how they can be accessed by editors, reviewers and readers who want to reproduce the results.

Please find attached a revised version of our manuscript entitled "*Recalibration of a three-dimensional water quality model with a newly developed autocalibration toolkit (EFDC-ACT v1.0.0): how much improvement will be achieved with a wider hydrological variability?*", which we would like to submit for your kind consideration. We hope that you will find the revised submission much improved. If not, we are willing to revise the manuscript until the editors and reviewers are satisfied with the revision. Thank you very much for considering our paper for publication to **Geoscientific Model Development**.

Sincerely Yours,

Chen Zhang, Professor
Tianjin University

Editor comments:

Topic editor (Dr. Jeffrey Neal):
General Comments:
Thank you for your revised manuscript. Unfortunately, the previous reviewers are unavailable, however I have read their comments and response. After reviewing the manuscript myself I only have a few comments below. Note that the last one is important because this is a core journal policy that associate editors do not have discretion to alter.
Overall, the manuscript is much improved and I believe this would be a suitable contribution to GMD should it be possible to resolve the remaining issues.
Response: We understand the reviewer as the voluntary activity and appreciate your careful reviewing of our manuscript instead and the thoughtful suggestions you have given us. We have further revised the manuscript in line with these suggestions. We hope that the revised manuscript will meet the relevant policies of the GMD. If there are any deficiencies, we are willing to make further changes until it meets the policy requirements. Below you will find our point-by-point responses to the referee comments.

Minor comments:
Comment 1:
Line 8*: The first sentence of the abstract doesn't make sense. Could you rewrite.*
Answer 1:
Thank you for your helpful suggestion. We have rewritten the first sentence of the abstract.
Please see the text in Abstract as follows.
Autocalibration techniques have the potential to enhance the efficiency and accuracy of intricate process-based hydrodynamic and water quality models. **(Page 1, lines 8-9)**

Comment 2:
Line 46*: "whereas some steps," I don't understand what these three words add to this sentence. It made more sense to me without these. If there is an additional point being made by this consider writing two sentences instead of one and making the argument in an understandable way. Or just simplify the existing sentence.*
Answer 2:
Thanks for suggestion. We have simplified this sentence to make it clear.
Please see the text in Section 1 as follows.
The first problem is that the manual calibration method (trial and error) commonly used in process-based hydrodynamic and water quality models is inefficient and does not guarantee optimal results. **(Page 2, lines 44-45)**

Comment 3:
Line 48: *"through the wringer" is a colloquialism. Could you use more formal scientific writing. Also, on the next line, what is "dramatic uncertainty"? Dramatic is used several times in the introduction to emphasis the importance of something but since the magnitude needed to be dramatic is never defined this wording is unnecessary/meaningless and just saying uncertainty would be more appropriate.*

Answer 3:

We agree with the editor and have made the corrections as suggested.

Please see the text in Section 1 as follows.

…Firstly, some steps, such as adjustment of inputs, tuning of parameters, evaluation of model performance and visualization of outputs, subject modelers to time-consuming and tedious tasks. Secondly, the parameter set selected by this method may still suffer from uncertainty and interferences of subjective factors. (**Page 2, lines 45-48**)

Comment 4:

Line 183: *For GMD it should be possible to simply run the model created for the paper. This section suggests anyone wanting to run the model would need to go to various sources in order to do so. This link for example gets a not secure warning form my browser. GMD starts from the position that openly providing the model and data to run the test case to run the test case is mandatory. Not doing this must be clearly justified, at the very least there would need to be a clear explanation of the licensing restrictions that prevent each data sets needed to run the model from being supplied. At the moment I'm not sure the science/model simulations are reproducible which is a major contradiction of journal policy. The code availability section makes out that all the data are available but I think this is incomplete because as the reviewer pointed out some is not and this need to be documented. There might be good reasons for this (e.g. public health) but the case is not made in the data availability section and it doesn't explain what a reader would need to do to obtain access and reproduce the results.*

Answer 4:

Thank you for your advice on the code and data availability for the manuscript, which we also think is crucial. We have revisited GMD's code and data policy. Based on the policy we have shared the meteorological dataset with hydrodynamic dataset together and given a clear explanation of the license restrictions in code and data availability. We also referred to the code and data availability sections of the following GMD articles.

1."... Data for all ensemble members are available upon request to the corresponding author ..." (Quilcaille et al., 2023, CMIP6 simulations with the compact Earth system model OSCAR v3.1. *Geoscientific Model Development*, 16, 3, 1129-1161, DOI: 10.5194/gmd-16-1129-2023)

2."... Due to intellectual property copyright restrictions, we cannot provide the source code for the UM or JULES ..." (Mulcahy et al., 2023, UKESM1.1: development and evaluation of an updated configuration of the UK Earth System Model. *Geoscientific Model Development*, 16, 6, 1569-1600, DOI: 10.5194/gmd-16-1569-2023)

We sincerely hope that the above changes have described our code and data availability section clearly and are in line with GMD's code and data policy.

Please see the text in code and data availability section as follows.

…The observed hydrodynamic and meteorological datasets are freely available from https://doi.org/10.5281/zenodo.8083303 (Zhang and Fu, 2023) on Zenodo. The Yuqiao Reservoir is an important source of drinking water and the public may be sensitive to the water quality conditions. Therefore, we cannot make water quality datasets publicly available due to the public health purposes. The water quality datasets are available for reviewers and readers who would like to reproduce the results upon request to the corresponding author. (**Page 18, lines 419-423**)