Numerical study of the seasonal thermal and gas regimes of the large artificial reservoir in Western Europe using LAKE2.0 model

Authors' responses to the Referee #2 final comments

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Introduction. Document structure

This document contains authors' responses to the comments of the Anonymous Referee. The document structure is the following:

- Referee's comments are numbered and given in *italic font*. General, specific, and technical comments come separately.
- Authors' response follows the comment and starts after **"Response:"** with normal font.
- The text from the article itself (if some changes are done, and if it is reasonable to provide it) is typed with `typewriter font` and separated from the response with an extra blank line.
- *Technical comments and mistakes* are not numbered, and authors' response follows immediately.

Reviewed manuscript with all the corrections is given after all responses. It contains the changes and proposals of **two** Referees and was prepared using LaTeXdiff package for better understanding of what has been changed.

Anonymous Referee #2

General comments

I put quite a bit of effort into reviewing this paper, and I am pleased to see how thoroughly and thoughtfully the authors have responded to my comments. Below I suggest a few more minor edits and suggested changes to the manuscript. After making these changes the paper should be accepted for publication. I will not need to review it again.

Response: We thank the Reviewer for the the time and efforts they put into work. The paper was re-edited and corresponding modifications were made according to suggested changes.

Specific changes

Pg 2 line 14 - vital activity » services
Corrected

Pg 2 line 24 - change acidity to pH
Corrected

Pg 4 line 21 has been » was
Corrected

Pg 4 line 22 definitely » for the remainder of the study
Corrected

Pg 5 line 6 processes is » processes are
Corrected

Pg 6 line 23 below the mixed layer of the euphotic zone?
Corrected: involving subsurface turbulent kinetic energy dissipation rate below the mixed layer of the euphotic zone, provided by the $k - \epsilon$ closure.

Pg 6 line 33 demonstates a big » undergoes a large
Corrected

Pg 7 line 4 allowed to improve the results » led to improved results
Corrected

Pg 8 fig 2 from the description in the paper it seems that the black dashed lines are to make the end of thermal stratification, but they clearly seem to be place on the heat maps at time of distinct thermal stratification (significant vertical temperatgure gradients). Check to see if there an error in the placement of these lines.
To determine the beginning and end of stratification period we used a criterion from Wetzel's "Limnology": temperature gradient should be higher than 1 degree per 1 metre depth. We put the dashed lines (stratification borders) at the places where such conditions occurs stably several days in a row. It may seems from the Fig. 2 that stratification ends too early in 2018, however, this just corresponds to the criteria mentioned above. In the end of September 2018 there still was a thermal gradient, but less that 1 degree/metre. This was re-checked once again.

Pg 8 line 18 cooling » cools
Corrected

Pg 9 I would suggest that you change
As in the real ML the temperature is not exactly constant, measurements from the sensor at 0.5 m depth were chosen for the comparison.
Since the vertical gradient of the measured ML temperature is not exactly constant , measurements from the sensor at 0.5 m depth were chosen to represent the mixed layer temperature in figure 3 .
Changed

Pg 10 I find this a little confusing
FLake provides ML depth, shape factor for the thermocline curve, ML and bottom temperature. It seems like these cannot be independent. The shape factor must in some way be dependent on the temperatures, likewise ML temperature must be dependent of the ML shape factor determining the ML depth. I think you just need to add a little more describing how this works.
That's right, in general, these parameters are not independent. However, we don't explain the principle of FLake calculations here but speak about how does the model represents the profile. Unlike the LAKE model, FLake's output provides those variables, which can be used to calculate the temperature profile backwards. The following changes were made in the text:
FLake outputs include ML depth temperature, shape factor for the thermocline curve, and temperature at the bottom. Using these values it is possible to retrieve a water temperature profile.

Pg 11 line 17 as well as the Flake » as well as Flake or as well as the Flake model
Corrected

Pg 15 line 6 this » these
Corrected

Pg 17 line 1. I don't quite understand what you mean by does not show large residuals. Fig 8b seems to me to have much higher residuals that fig 8a
That's true, however, we wanted to point out there that after almost six months the model showed realistic results, quite close to monthly average value of CO_2.

Pg 17 line 5 delete - values of O2
Corrected

Pg 17 line 6 delete - (underestimation of O2 values) and winter minimum (high overestimation)
Corrected

Pg 17 line 7 Supposedly » probably
Corrected

Pg 17 line 8 for elimination this flaws » to improve model performance
Corrected

Pg 17 line 8 inside the lakes » of lakes
Corrected