

Dear Authors,

First of all, I appreciate your great important work that significantly contribute to the lake investigation field. Studying the long-term climate-induced changes in Lake Balaton's thermal structure is definitely giving the future researchers and policy makers a good applicable/scalable approach that can be used for further development. The comments below are just for improving the current work and making it interesting for other readers as well.

My opinion is: Accepted for publication after addressing the comments below.

Abstract:

Although the general information about the workflow has been mentioned, but still, the reader does not know what kind of modeling will be seen in the text. The text is clear and well explained in some aspects but there is a lack of modeling and some quantitative key results if there's any.

Introduction :

Line 32: Not just in "extreme cases", it might be possible for some shallow lakes, the oxygen depletion happens depending on the stratification strength, the bathymetry of the lake, the lake surface water temperature etc.

(Line 33): In general, when the algal blooms increases then the chance of oxygen depletion increases and may lead to water quality problems.

Line 34-35: The conclusion seems overclaimed: Climate change might generally increase thermal stability not "Even" in polymictic. The word "even" gives the a meaning of separation from the rest of the types of lakes. We should not conclude this evenness now for the climate change effect which is generally affecting all aspects of the water bodies.

Line 51: The typos in terms of writing: Either "They are more sensitive" OR "they sensitively reacting to climate change"

Line 50-60: While the tonality of the text before line 49,50 turned into guidance, policies, upper principals, then in these lines, we see again some introductory information that takes the reader back to the basics of the issue.

Lines 65-75 are also suffering from this problem. These lines along with the previous lines are not coherent and consistent with each other although they have been written very carefully and clearly.

Line 80: Still, we have not seen the other previous literature problems (stating the research gaps and questions that have not been covered through the previous works that can enforce/push us to continue why this is an important research that should be done. Also the model is still unclear to me. Until I go to the methodology and look at the details then I realize you are supposed to use GOTM with a new workflow that has been designed by you. If the novelty is the workflow, we have not seen in the introduction stated out clearly explicitly. If the novelty is the threshold you define or you design, it is not clear at least to me. The novelty is the time period that is being predicted, I don't see the novelty statement selling this point.

Line 85-end: I don't grasp the key points of these final paragraph. In the meantime that it tries to play the final paragraph role, it still shows like abstract, introductory, results discussion etc. I believe, the final paragraph is like punching the readers to proceed with the text.

In general, the introduction parts have been written good but they are not well structured and don't follow each other however the writers might have an opposite opinion. For example, I surely know the importance of studying polymictic lakes but from the introduction I got confused whether this is study that forced to be related to polymictic because of any reason (data availability etc) or there was an urgent issue about this type of lake (that are more sensitive to the climate change and anthropogenic activity). If you see I have seen the words but I could not get this from the whole introduction which takes me to the second part of the paper (materials and methods), where you are talking about the study area.

Materials methods:

line 91: As I previously mentioned I don't find any good reason of choosing this area as an example except the availability of the data. Is there any specific condition that excludes this lake from the other please state it otherwise, if it is just because its data was available and clean , please change the text accordingly.

Lines 102: It would have been good if we had either a subheading about the data acquisition and solely talking about it or making it smoother for those who has not been familiar with the technicalities of the employed model. I see the aims of using a part of data for training the weather generator to downscale, without prior knowledge on the details of the model unless you say it is for knowledgeable readers.

Results and discussions:

General opinion about the results discussion: Following the section is a bit hard and I suggest try to smooth it. Also, there is a lack of inconsistencies between the introduction aims and scope, and what the results are presenting which again goes back to the issues with the introduction.

Line 223: Typos, repeating “Materials and methods” instead of “Results and discussion”

Technical comments: The authors specifically designed a workflow to address the lack of sub-daily data in climate models. You validated the 6-hour downscaling against hourly ERA5 data for the 2000–2020 period. The comparison showed that while statistical consistency (mean, median, and standard deviation) was preserved, there were minor discrepancies in extreme values: water temperature was slightly overestimated (max difference of 0.3 °C), and stratification intensity (ϕ) was slightly underestimated (max difference of 0.9 J m⁻³)

Another comment is related to the use of linear Bias correction. Although Future projections assume that changes scale linearly from the baseline, it is allowed to do that, but at the same time it introduces a potential source of error if climate responses become non-linear toward the end of the century.

Major comment on the results: One of the key issues of the predictions and projections long-term or short term is the “Confidence Intervals”, and “Uncertainty levels”. It is important to know to what extent the prediction is credible upper bound and lower bound. This is statistically significant to ensure if the predictions are correct first and more importantly safe. The figures that are showing the projections and predictions, should also show the confidence intervals and shaded area of the uncertainty upper/lower bounds.