Author comment: as both reviewers advised, the manuscript will be sent out to professional language editing shortly. In order to meet review deadlines, these responses to the reviewer comments contain the recommended amendments to the manuscript content. Please note that all amendments may be subject to further improvement during the language editing process.

Response to the Referee's comments

Response to the comments of Anonymous Referee #2

R2-C1.This is a paper on an important topic: a detailed analysis of the dynamics and potential impacts of oxycline oscillations in a deep meromictic lake. In addition, the lake in question, Lake Iseo, is one of the five major Italian pre-Alpine lakes all of which are more or less meromictic, and which are extremely important from an economic and recreational standpoint. The author team is well-qualified to conduct this application as the group includes scholars who are among the best European physical modelers focusing on such systems (Pilotti & Valerio), as well as two of the top researchers on lake sediments (Lau & Hupfer). The paper is technically sound and is a major contribution to characterizing the impact of internal waves on sediment-water exchange of solutes. Although, as referenced by this paper, previous work has been conducted on the influence of internal waves in holomictic lakes, much less attention has been paid to how such oscillations effect transport at the chemoclines of meromictic systems. Because the chemocline is persistent and marks the boundary between regions with very different chemistries, this study is a major step towards eventually predicting the transport of nutrients and contaminants from the sediments back into a meromictic lake's surface waters. Although I recommend that this paper be published, I have two general suggestions that should be addressed prior to publication.

Reply R2-C1. We sincerely thank the Reviewer for recognizing the importance and novelty of the topic.

R2-C2.I think the paper goes into too much detail regarding the results. I would suggest that the authors tighten up the text (as well as the figures and tables) to make the paper easier to follow. For example, I think some of the tables could be placed into supplementary materials.

Reply R2-C2. As also noted by the first reviewer, we agree with the Reviewer 2 that the paper can be made easier to follow. Therefore, we firstly followed the suggestion of the Reviewer, removing Table 3 and Figure 9 from the main paper and placing them in a supplementary material document. We also reviewed the whole text, shortening the Results section by focusing the text on the more relevant information. For example, we removed L188-189, L209-211, L222-223, most of L227-232, L277-284, L308-310, L326-333, L334-341, L359-361, and we strongly synthetized the description of low-pass filtering analysis (L237-242, L246-251)

R2-C3.Although I had no problem understanding the content and organization of the text, the authors are not native English speakers as I found lots of awkward wordings as well as typos that were frustrating. Here are a sampling of some lines that illustrate my point. There are quite

a few other small errors of this type. If the journal does not provide very strong copyediting, I would suggest that the authors do a spellcheck and ask an English-speaking colleague to copyedit the article to smooth and make corrections to the manuscript.

Reply R2-C3. We agree with the Reviewer that the manuscript can benefit from a linguistic revision. To improve the whole style of the paper and correct linguistic errors like the ones highlighted by the Reviewer, the manuscript will be sent to a professional editing service.

R2-C4.Line 67:that under the internal wave motions of the deep oxycline, the contiguous sediments undego

Reply R2-C4. We thank the Reviewer for noting this misprint. “undego” was replaced with “undergo”.

R2-C5.Line 141:measured internal oscillations. This required to identify the temporal evolution of the periodicity and measured internal oscillations.

Reply R2-C5. We agree with the Reviewer. The sentence was modified to “Therefore, we quantified the temporal evolution of the periodicity and the spatial structure of the free modes in Lake Iseo.”

R2-C6.In the following, aside from the repetition (“the one the one”), there should be a space between the units "m" and "s": Line 173:of 5 ms-1, whose spatial and temporal structure fit the one the one predicted by the eigenmodel for

Reply R2-C6. We thank the Reviewer for noting this misprint. The text was modified accordingly.

R2-C7.Line 389:there are large and periodic displacements of the oxycline. The oxycline typically oscillation in the

Reply R2-C7. We thank the Reviewer for noting this misprint. The sentence was modified as “The typical oxycline oscillation in the southern basin is in the range of 10 – 20 meters”.

R2-C8.Line 406:Accordingly, this works provide experimental and numerical evidence of a chemical gradient

Reply R2-C8. We thank the Reviewer for noting this misprint. “this works provide” was replaced with “this work provides”.

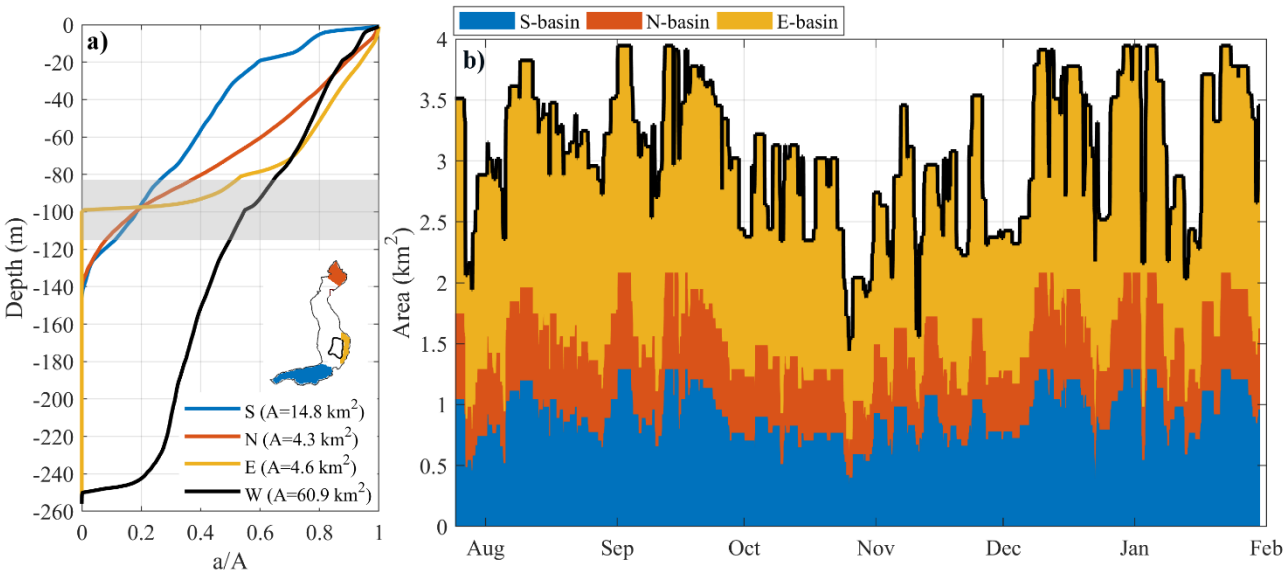
R2-C9.Line 445:basin. The analysis of its oscillations over a 3 days window provided the time series of the area

Reply R2-C9. We agree with the Reviewer. The sentence is not present anymore in the main text, but in the caption of Figure 10. Here the sentence was modified as “The areas were computed by considering the oscillations of the oxycline over a 3-day long time window”

R2-C10.In the following, note that the two panels of Fig. 10 are not labeled (a) and (b): 436:conditions will be mainly located in the northern, southern and eastern sub-basins (see Fig. 10a).

Reply R2-C10. The panels were labelled but with a small font size. Accordingly, the figure was modified and a) and b) were written in a larger font (see Figure 10-R below).

Figure 10-R. (b) Estimation of the area of the bottom sediments subjected to alternating redox conditions. The areas were computed by considering the oscillations of the oxycline over a 3-day long time window. The three colours make reference to the contribution of the southern (S, blue), northern (N, red) and eastern basin (E, yellow), as shown on the map. In the left panel (a), the area-depth curves indicate the cumulative area "a" of the bottom situated below a given water depth in the whole lake (W) and in each sub-basin (E, N, S). In the x-axis, the area "a" was normalized with the total area "A" of each basin. The grey shaded area marks the maximum and minimum vertical displacement of the 0.5 mgDO L^{-1} recorded at LS-S, highlighting the area of the bottom where the oxycline fluctuates.



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