

Response to reviewers

Dear Editor and Reviewers:

Thank you for your letter and for the reviewers' comments concerning our manuscript entitled "Rapidly increasing sulfate concentration: a hidden promoter of eutrophication in shallow lakes" (bg-2022-77). Those comments are all valuable and very helpful for revising and improving our paper, as well as the important guiding significance to our researches. Taking account of reviewers' comments, we have revised and improved the manuscript. We hope our revisions meet with approval. Revised portion is marked with blue in the manuscript. The main corrections in the paper and the responses to the reviewers' comments are as follows:

Associate Editor:

1. In the methodology, you have mentioned the collection of gravity cores. What is the dimension of the core? Did you subsample the gravity core for the measurement of pore water ionic concentrations? How the sampling was done and what method was followed to extract sediment pore water?

Response:

Thanks for your professional questions. In this study, the surface sediment (0-20cm) was collected by a gravity core sampler with the length of 1.5 m and the diameter of 0.2 m. However, we did not measure the pore water ionic concentrations. In this study, we focused on the phosphorus released from sediments with the increased of SO_4^{2-} concentrations. Therefore, we measured the AVS and phosphorus concentrations in bulk sediments rather than the pore water. We have modified the expression in *materials and methods* section.

2. I could not find sediment pore water data in the manuscript result section. Do you have the concentration data of pore water? Better to mention how AVS was extracted and quantified at least briefly. Just referencing may not be enough.

Response:

Thanks for the meaningful question. In this study, we did not measure the pore water as mentioned above. For the extraction and quantification of AVS in the sediment, we have added the schematic diagram and the methods from line 171 to 177 in the revised manuscript.