

Biogeosciences Discuss., referee comment RC4  
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## Comment on bg-2022-77

Anonymous Referee #4

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Referee comment on "Rapidly increasing sulfate concentration: a hidden promoter of eutrophication in shallow lakes" by Chuanqiao Zhou et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2022-77-RC4>, 2022

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The manuscript submitted by Zhou and colleagues explored the effect of sulfate reduction on phosphorus release from sediment. The authors constructed a series of microecosystems with different initial concentration of  $\text{SO}_4^{2-}$ , and explained the mechanism of promoting the release of endogenous phosphorus according to the changes of sulfur, iron and phosphorus during the cyanobacteria decomposition. This study proposed that the release of endogenous phosphorus was an important reason for maintaining lake eutrophication, which provided a new insight for lake management. While the topic is interesting and relevant for the journal, there are also some questions about the whole story that the author needs to answer and modify.

The authors described carefully the collection of samples required for experiments and the set-up of incubation microcosms in the section of "2. Materials and Methods". However, some photos of sample sites and schematic diagrams of experimental groups will be more convincing and straightforward.

L157-167. The chemical analytical methods involved in the manuscript need further introduced. Authors need to add further detail to describe the index test method involved in manuscript.

During sampling of incubation microcosms, how to control the anaerobic and air pressure changes in the gas extraction process?

This study has been conducted for 48 days. The source of reference for this time should be indicated. Is it any value to assume that the experiment lasts longer?

Figure 1: It seems complicated. I suggest highlighting the main line of the article and adding some easy-to-understand symbols.

L262. "During the decomposition of cyanobacteria, SRB abundance significantly changed."

Please show the result by statistical results.

This study discussed that expect for climate warming and external input, the release of endogenous phosphorus is also an important reason of eutrophic lake. Why didn't the authors determine its proportion of contribution and discuss the contribution rate of endogenous nutrients in a more detailed way in the manuscript?

L279-281. "Cyanobacteria released large amounts of organic matter during their decay and decomposition, which promoted microbial growth and ultimately promoted anaerobic reduction of sulfur and iron (Holmer et al., 2001)."

The authors obtained this result based on the results and references. But a detailed explanation of the biochemical process followed this sentence. Since the anaerobic reduction of sulfur and iron is quite complex, I suggest that more attention should be paid to the logic of the discussion here. Putting this sentence after the biochemical explanation will make the discussion clearer.

In this manuscript, the results and discussion of microorganisms are insufficient. I suggest that the author can supplement more data to make the study more comprehensive.

This study indicated that the sulfate reduction promoted the release of endogenous phosphorus in eutrophic lakes. The authors may be able to compare this study with the non-trophic lakes in the middle and lower reaches of the Yangtze River.

Some of the outdated references should be replace with more recent one.