

Biogeosciences Discuss., referee comment RC2
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Comment on bg-2022-77

Anonymous Referee #2

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-RC2>, 2022

The manuscript by Zhou et al. investigated the effects of different levels of sulfate concentrations and sulfate reduction on P mobility and release subjected to cyanobacteria decomposition. This work is interesting and the authors found a new contributing pathway of eutrophication in lakes. However, there are several problems still need to be revised especially in the experimental design and discussion sections.

1. The accumulation and decay of cyanobacteria in eutrophic lakes might change the physical and chemical environments of water body and form anaerobic reduction conditions. However, cyanobacteria decomposition also released a large amount of phosphorus. This has implications for determining how much phosphorus was released from the sediments, how does the authors solve this problem.

2. Microorganisms play an important role in the biogeochemical cycle of lakes. The increased of sulfate concentrations will affect the abundance and activities of microorganisms. More data are needed to report these results in the discussion section.

3. The authors set up a series of sulfate concentrations from 0 to 180mg/L. However, some concentrations of sulfate were too high, therefore, some background data of sulfate concentration can be added in eutrophic lakes and to explain the role of sulfate concentration gradients in microsystems.

4. Why use cyanobacteria powder instead of fresh cyanobacteria? What is the meaning of cyanobacteria powder? The cyanobacteria powder and fresh cyanobacteria may have different ecological effects.

5. Please explain destructive sampling's definition and the reason for choosing this method. Authors need to explain how to keep anaerobic environment during incubation.

6. Line 40, Line 128 "cyanobacteria bloom" please keep the form of the full manuscript consistent. Line 116 "cyanobacteria outbreak", Line 367-368 "outbreak of cyanobacteria". Please keep the form of the full manuscript consistent.

7. Fig. 1, the coordinate of iron concentration should be consistent in different groups for comparison and observation.