Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2019-243-RC3, 2020

Biogeosciences
Discussions

Interactive comment on "Vertical transport of sediment-associated metals and cyanobacteria by ebullition in a stratified lake" *by* Kyle Delwiche et al.

Anonymous Referee #4

Received and published: 27 January 2020

General Comments: The manuscript by Delwiche et al describes the contribution of bubble-mediated, vertical transport of particles, chemistry, and biology within a lake. This is a valuable observation with a unique laboratory experiment to support the results. The observations found here are fascinating and worthy of publication. I am supportive of publication; however, the issues with sample collection make me call into question the quantitative results and budget. Please see my specific comments below for further details. Ultimately, the data need to be published, but the manuscript needs major revisions to remove the budgets which are likely inaccurate, given the sample collection procedure. Please refocus the manuscript to state the observations and cast your results in light of how the samples were collected.

Specific Comments: L 23-24: Define "problematic". What does this mean for cyanobacteria? Be more specific. L 29-30: What about the "improved understanding"? What type of understanding? Be specific. L 110-111: How do you know the bubble-transported biology and chemistry is no adhered to the inner walls of sampling equipment? Do your measurements represent an underestimate? L 172-173: Are these filter measurements meant to be volumetric? If so, do you know how much water passed through each filter before clogging? L181: I don't know how this relates to the accuracy and precision of your measurements? How do counts per second relate to concentration? L 266: This is an excellent study and I think your experiments and testing shows bubbles play a role in lakes that has not been considering from a biological perspective. This study needs to be published, but I can't get over the anchor drop issue. I have thrown many anchors overboard in lakes and the plume of sediment is always significant. I have a hard time decoupling this disturbance with your results. There needs to be a paragraph describing how the laboratory results follow the lake results and the anchor had minimal impact on the lake results. Although, your laboratory results show sediment disturbance impact the bubble transported particles. How can you decouple these methodological problems with your results? What if you shift the focus of your manuscript to documenting that bubbles DO transport chemistry and biology, but stop short of the full budgets, as I think those are biased due to the methodological problems. L 268-270: This observation is baseless since you caused the ebullition. L 277-280: This is analogous to dropping an anchor on the lake sediments. How do you reconcile these laboratory experiments with what you did in the field? Again, this is evidence the focus of the manuscript should be focused to an observation that bubbles do transport chemistry and biology, but do not calculate budgets because the evidence shows they are not accurate. L 283-285: Were there particles to scavenge? This was tap water, right? Section 3.3 header: Again, I have a hard time reconcile the topic of this section that particles originated in the sediment after traveling through a plume of sediment. Maybe scavenging is a more active process and makes up a larger percentage of the particles when not passed through a plume of sediment. L 325-326:

Observations like this are the reason this manuscript needs to be published. L 353-354: This is a major finding of this study and should be a highlight. L 374: What does it mean to have a negative rate of transport? Are bubbles actually sequestering cells from the surface waters? This is another reason why I think the budgets need to be removed and the focus placed on the observations and laboratory experiments. L 400: Given the large errors in your bubble transport of cells, I have a hard time following how the error now is so small. The error propagation is not well explained.

Technical Comments: L 22: Delete "are". L 22-23: First sentence needs a citation. L 32-34: First sentence of the paragraph, poor sentence structure, please rewrite. L 35-37: "However, transport to surface. . ." Poor sentence structure, please rewrite. L 45-46: "Bubbling from anoxic sediment. . ." Sentence missing numerous citations. L 50-53: "Bubble-mediated particle. . ." Poor sentence structure, confusing, please rewrite. L 184-185: "We filtered bubble. . ." I did not understand this sentence. L 187: How much lower are the blanks? Actual numbers would be better. Two orders of magnitude can range from 110-fold lower to 900-fold lower. These are very different blanks. L 249: mL-1 gas volume or mL gas volume-1? L 250: Estimate – estimated (past tense). L 258: Bring eq. 1 up so that the reader knows the equation before getting the variables. Rewrite the part about the depth interval for germination. I was lost. L 362: This is a concentration, not a rate. L 365: Keep units consistent. Use slash or exponent throughout.

Interactive comment on Biogeosciences Discuss., https://doi.org/10.5194/bg-2019-243, 2019.