

Interactive comment on “Phytoplankton communities determine the spatio-temporal heterogeneity of alkaline phosphatase activity: evidence from a tributary of the Three Gorges Reservoir” by Yijun Yuan et al.

Anonymous Referee #1

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General Comments:

The manuscript has a goal to investigate the importance of phytoplankton to bulk alkaline phosphatase activity (APA) in a tributary of the Three Gorges Reservoir by assessing size fractionated APA and using correlations to infer relation to environmental parameters and phytoplankton communities. There are some fundamental flaws and assumptions made by the authors, which make the relevance of this type of analysis questionable.

First, the authors purport that since APA on size fractions $>3.0\mu\text{m}$ is greater than that

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on $0.45\text{--}3\mu\text{m}$, phytoplankton are the main source of APA. There is a wealth of emerging information showing that many (if not all) phytoplankton cells have a host heterotrophic bacteria inhabiting or in close association with cells, making these types of measurements difficult to assign to individual cells alone. Further, many phytoplankton exist in the $1\text{--}3\mu\text{m}$ size range. At best, the study can show distributions of bulk APA across different size fractions. To assign them to phytoplankton or bacteria requires additional analysis (likely coupled genetic probes and/or ELF). Lastly, to call the $<0.45\mu\text{m}$ “dissolved” seem suspect as well as many bacteria can slip through a $0.45\mu\text{m}$ filter and there are likely significant populations of heterotrophic bacteria inhabiting this size fractionated water.

Secondly, there is a timing issue of when samples were retrieved and when they were analyzed. The methods seem to indicate that samples were collected and then 24 hours later, analyzed. Depending on how the water was stored (which was not indicated in the methods) many of the physiological and biological parameters which were measured (such as chlorophyll, TP, SRP, and COD, and APA) will have dramatically changed in that timeframe. Therefore, what is observed at 24 h post collection will not reflect in situ conditions.

Therefore, any conclusions based upon these methods and assumptions are difficult to interpret.

Specific Comments:

APA method is the same as Wang et al., perhaps the authors should acknowledge that. The sentence structure in many instances needs to be addressed as there are missing words and incorrect use of English language. I have highlighted some instances below.

In the discussion section, it seems the authors suggest that the dominant cyanobacteria was *Microcystis*. Since this organism exists in colonial form, how were these counted? Further, supporting points above, colonies of *Microcystis* are inhabited by a host of other organisms including heterotrophic bacteria and in some cases diatoms.

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Therefore, when the authors correlate bulk APA to cyanophyta when cyanophyta dominate the community, they inadvertently neglect an important complexity to these communities. Fig 8 – Although I have no way to disprove the authors, based upon this plot it seems suspect that $APA > 3.0 \mu\text{m}$ would have a significant positive relationship with cell density

Technical Corrections:

Line 12 – “investigation was” should be “investigations were”

Lines 18 to 19 – “Cyanophyta” and “Bacillariophyta” are not “species” but phyla

Line 31 – add a “a” between “hydrolyze” and “broad”

Lines 44 to 46 – I don’t believe Nausch says this at all.

Line 81 – How were water samples stored between sample time and analysis 24 hours later?

Line 96 – there seems to be a problem with the PDF here as some of the methods appear outside of the margins

Line 258 – or more likely, increased concentrations of SRP

Interactive comment on Biogeosciences Discuss., doi:10.5194/bg-2016-455, 2016.