

Interactive comment on “Sequential Nutrient Uptake by Phytoplankton Maintains High Primary Productivity and Balanced Nutrient Stoichiometry” by Kedong Yin and Paul J. Harrison

Anonymous Referee #3

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Yin and Harrison have attempted to prove that there is preferential biological uptake of the most limiting nutrient as soon as the nutrient is added into the system. They provide high resolution nutrient data set and very interesting schematics (conceptual Fig. 1) to prove their claims. I enjoyed reading this manuscript but I still have the following suggestions that can improve the manuscript.

General comments:

1. Research in this manuscript roams around the nutrient uptake ratios. We know that the nutrient uptake and stoichiometry are phytoplankton composition dependent (see Singh et al. 2015; Mills and Arrigo 2010). Authors have not provided any cell abundance microscopic data. I understand this research was conducted long time

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back but it would still improve the manuscript if authors could provide something on this aspect. They have mentioned a sentence on this in the discussion section (line 317-319) but I suggest them to add some more discussion on this.

Specific comments:

Line 38: '3' in 'nitrate' should be made subscript.

Line 103: Fig. 1 in the heading looks a bit odd

Line 111: Give space after full stop

Line 111: N:P ratio of what? of nutrients?

Line 118: Just average nutrient ratio is not 16N:1P, it is rather when averaged for all the communities together

Line 121-122: “The remaining.....phosphate.” Which species can take phosphate without taking any nitrate? Diazotrophs? Do they occur in the study area?

Line 175-177: “The incubation flasks.16m).” Mention the light intensity at 16 m, at least with compared to the surface value in terms of %. What was the euphotic depth?

Line 184: What is T7? It is not described in the conceptual model.

Line 186: “due to an increase in NO₃⁻ in the deep water”, what was the source of this high nitrate? What was the station depth?

Line 187: How do the authors know that the silicate is from Fraser River? What is the silicate concentration in the river?

Line 188: “top of the nutriclines” or “top of the nutriclines at T7”

Line 192: “A strong wind”, provide wind speed.

Line 220: '3' in 'nitrate' should be made subscript.

Line 235 “both.....undetectable”. What could be the reason for this?

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In nature, who could still utilize phosphate and silicate without nitrate?

Line 249: How was the uptake ratio estimated?

Line 359: 'this' should be followed by 'study'

Line 356-363: Conclusion seems to be a bit misplaced. A lot of processes have been discussed and presented in the results but the authors have concluded only sequential uptake (which is not very convincing since there are neither any uptake measurements nor any information on community composition)

References:

Mills, Matthew M, and Kevin R Arrigo (2010) Magnitude of Oceanic Nitrogen Fixation Influenced by the Nutrient Uptake Ratio of Phytoplankton. *Nature Geoscience* 3(6): 412–416.

Singh, Arvind, SE Baer, Ulf Riebesell, AC Martiny, and MW Lomas (2015) C: N: P Stoichiometry at the Bermuda Atlantic Time-Series Study Station in the North Atlantic Ocean. *Biogeosciences* 12(21): 6389–6403.

Please also note the supplement to this comment:

<http://www.biogeosciences-discuss.net/bg-2016-426/bg-2016-426-RC3-supplement.pdf>

Interactive comment on *Biogeosciences Discuss.*, doi:10.5194/bg-2016-426, 2016.