

## ***Interactive comment on “Phytoplankton growth and physiological responses to a plume front in the northern South China Sea” by Qian P. Li et al.***

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Response to Reviewer #2 (25 January 2018)

1. “The discussion is insufficient to address all the issues. It’s not surprise to see enhanced phytoplankton growth by elevated nutrients. But what about the N/P ratio? The increasing Chla production and net growth rate with mixed ratio in Fig. 7 in day 1 is not the response of S4 phytoplankton to PW addition, but essentially the response of mixed communities of S2 and S4 to different levels of nutrients concentrations and N/P ratios (Fig. 1). The differences in net growth rate may be related to the changes of N/P ratio. The discussion about the optimal N/P ratios for phytoplankton in plume waters is essential (Geider & Roche 2002). If we compare Fig. 8 with Fig. 9 and

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Fig. 6 for the same stations, such as S6 and S7, we can find different changes in size structure of Chla in day 1. Nano-phytoplankton showed greater responses to FPW than to BW/FBW and to nutrient addition. It may imply influences of N/P ratio on different species.”

Response: In the revised manuscript, we have added more discussions related to the influence of N/P ratio on phytoplankton chl-a production and growth rate. We agree with the reviewer that the mixing experiment shown in Figure 7 should reflect the response of the mixed community (S2 and S4) to varying mixing conditions (with different nutrient concentrations and N/P ratios). We have discussed the impact of the optimal N/P ratios on the different phytoplankton species as suggested by the reviewer.

2. “I find the incubations were made in May and June. But the manuscript has the April hydrographical data. It confuses me. What’s the additional value of April data to this paper?”

Response: We think the hydrographic data of April cruise is valuable to this manuscript, since it can better present the temporal change of the plume front during the spring-summer.

3. “Fig. 1. You may zoom out a little bit, so we can see S3 and S7 clearly. You have the salinity contour in the graph. Is it a composite of three cruises or just the June cruise? You use different symbols for S1, S3, S5 and S2, S4, S6, S7, respectively. Do you mean S1, S3, S5 were in May, S2, S4, S6, S7 were in June? Were S5 and S6 in the same position? What is S8 in the map? You don’t have S8 in Table 1.”

Response: Done. We have redone Figure 1 as suggested by the reviewer. It is a composite of three cruises. S1, S3, and S5 are from May and S2, S4, S6, S7, and S8 are from June. S8 and S6 are located in the same places as S4 and S5, respectively. We have also added S8 to Table 1.

4. “Fig. 2. The title is “A Temperature vs. Salinity diagram during May-June 2016”. But

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you have April data in it.”

Response: Done. Thanks for pointing out this. We have corrected it the revised manuscript.

5. Fig. 4. The same question, is it a composite of three cruises or just the June cruise?

Response: It is a composite of three cruises.

6. P2-21, “affect the large area of” is “affect a large area”

Response: Done.

7. P2-25, “a P-limitation of phytoplankton” is “a P-limitation of phytoplankton growth”

Response: Done.

8. P5-16, what’s “black filter”, do you mean “neutral filter”?

Response: Yes, it is a neutral filter. We have corrected this in the revised manuscript.

9. P5-21, “These waters were used to dilute the local surface waters at S6, S7 and S8” in what percentage?

Response: The percentage of dilution was 12.5%. We have added this information to the paragraph in the revised manuscript.

10. P5-26, can you specify the “biological impact”?

Response: Done. It is the impact of vertical mixing and upwelling on phytoplankton growth. We have clarified this in the revised manuscript.

11. P6-1, the percentage of 100% for S2, literally means no S4 waters, but you said it’s a mixing experiment. It’s good to have a comparison. But it’s confusing. Maybe to say S2 instead of 100%.

Response: Done.

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12. P7-4, “warming effect” is usually used when we are referring to an impact of global change, here I think it’s just a seasonal change of temperature.

Response: Done. We have replaced it by “increase of temperature”

13. P7-20, “This water”, I can see two water masses in the previous sentence. So, which one did you refer to?

Response: It is the water of low temperature and high salinity. We have clarified these in the revised manuscript.

14. P9-3, “controlled by” is “contributed by”

Response: Done.

15. P9-14-17, I can see a smaller value of nano-phytoplankton chl<sub>a</sub> in 75% than that in 50%. Does pico-phytoplankton chl<sub>a</sub> in 75% statistically lower than that in 50%?

Response: We do not found statistical difference for picophytoplankton between 50% and 75%. We have corrected this in the revised manuscript.

16. P9-27 & P10-1, “At station S6, the raw plume water (PW) was also added to the surface water for incubation to account for the advective chlorophyll input by the river plume.” This necessary information should be in the method section.

Response: Done.

17. P10-8, you can do the maths for N/P ratios since you have the numbers in the table.

Response: Done.

18. P10-6, in the section 3.4, the discussion about the nutrient limitation status and grazing activity should be moved to the discussion section.

Response: Done.

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