

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

**Qian P. Li et al.**

qianli@scsio.ac.cn

Received and published: 9 March 2018

Response to Reviewer # 3 (26 January 2018)

1. The nutrient concentrations were not measured to assess nutrients uptake by phytoplankton in the shipboard incubation experiments

Response: Nutrient concentrations were actually measured during incubation experiments. We have added these data to the revised manuscript to discuss the changes of chlorophyll and nutrients over incubation time. P-limitation at stations S1, S2, S3, and S4 was confirmed by change of N and P during incubations: there were enhanced N consumptions by addition of P, but P consumptions were not stimulated by addition of N. N-limitation of S6 was supported by enhanced P consumptions by N-addition (but

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N consumption was not enhanced by P-addition). N and P co-limitation at the second day of incubation found at S7 was due to running out of N by P-addition during the first day of incubation.

2. The incubation bottles with smaller volume. The phytoplankton in culture media with smaller volume would be diluted by addition of plume waters and bottom waters, and the water sample could not be enough to get chl a samples. I do not think incubation experiments lasted for two days was enough to evaluate the phytoplankton growth to inorganic nutrients because the culture time is too short.

Response: We thank the reviewer for constructive comments. The dilution effect had already been corrected in the initial chl-a concentration in our original manuscript. As chl-a concentrations of coastal waters were much higher than the offshore waters in the NSCS during our cruises, the bottle volume of 2.4L could already allow us to get enough chl-a samples. For stations near the outer shelf, we have parallel experiments to make sure we have enough water for chl-a sampling. We have clarified these in the revised manuscript. We agree with the reviewer that it would be better if the incubation experiments could continue longer than two days. However, we are not allowed to perform a long period of incubation due to limitation of cruise time. On the other hand, previous results over the NSCS shelf (Li et al., 2016) indicated that phytoplankton here would react fast in the first two days of incubation and then go stable. Our nutrient data also suggest that two days of incubation are long enough to evaluate phytoplankton responses to nutrient drawdown (see our revised figure 6).

3. In the manuscript, there were no parameters concerning physiological response.

Response: We agree with the reviewer that we do not have direct measurements of physiological parameters. We have replaced “physiological response” in our title by “phytoplankton response” in the revised manuscript. Nevertheless, we believe the results of nutrient addition experiments and water mixing experiments should reflect physiological change of phytoplankton to varying nutrient conditions.

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4. P6, line 1-2, the descending salinity would have obvious effect on phytoplankton growth, and the paper didn't evaluate the direct effects of salinity.

Response: We agree with the reviewer about the effect of salinity on phytoplankton growth. We have discussed this properly in the revised manuscript. Coastal phytoplankton species can generally tolerate a much larger range of salinity than estuarine and oceanic species (e.g. Brand 1984). The salinity of 6.6-30.7 during the mixing experiment at the frontal zone is higher than the lethal level of  $\sim 5$  for most estuarine phytoplankton species due to osmotic pressure (Kies, 1997; Floder et al., 2010). However, inter-specific differences in salinity tolerances of phytoplankton may be important for phytoplankton growth at the lower ranch of the PRE where fluctuating salinities between 0-10 were found.

5. P8 line 16 delete "of"

Response: Done.

6. The incubation site S8 was not marked in Figure 1. The hydrographic and biogeochemical properties of S8 were not mentioned too.

Response: Done.

7. In Figure 1 the white salinity lines were marked as 22 and 32, which were described as 26 and 32.

Response: Thanks for pointing out this. We have corrected it to 26.

8. In Figure 2 "A Temperature vs. Salinity diagram during May-June 2016" should be corrected as April-June 2016.

Response: Done.

Please also note the supplement to this comment:

<https://www.biogeosciences-discuss.net/bg-2017-495/bg-2017-495-AC3->

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Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2017-495>, 2017.

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