

Interactive comment on “Nutrient limitation of phytoplankton in anticyclonic eddies of the northern South China Sea” by X. Ning et al.

Anonymous Referee #1

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Ning et al. set-out to investigate the coupling phytoplankton nutrient limitation in two anti-cyclonic eddies in the South China Sea (the Hong Kong Southeast Anticyclonic Eddy (HKSEACE) and the Hainan Island East Anticyclonic Eddy (HIEACE)). Their approach is to first describe the physical and chemical characteristics of these two downwelling eddies and to then present the response of the within eddy phytoplankton communities to nutrient additions. Their stated objectives were too gain a better understanding of 1) the within eddy coupling of the physics, chemistry, and biology and 2) determine the responses of the phytoplankton communities to nutrient enrichment in the anticyclonic eddies of the nSCS.

I find the first objective to be a bit broad. As a result it is not well addressed in the current manuscript and I will comment mostly on the second objective. As to the sec-

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ond, their effort is good, however a successful nutrient enrichment experiment using multiple nutrients (N, P, Si here) requires that the treatments be made up of each nutrient individually, as well as, all combinations of nutrients. In the current manuscript, the treatments consisted of N, P, Si, NP, and NPSi. The combinations NSi, and PSi were not carried out, and the result of the first experiment suffers from this. In this experiment, phytoplankton responses were observed in the NPSi treatment alone. As a result, it is impossible to say if the phytoplankton community was NSi, PSi, or NPSi co-limited. The authors have no choice but to claim the latter, but both the former possibilities are possible and the conclusions ought to reflect this. The second nutrient enrichment experiment had more clear results as the NP, and NPSi treatments responded similarly. Thus, the conclusion of the authors that the community was NP co-limited here is valid.

Overall, I find the introduction does not describe the significance of nutrient limitation in anticyclonic eddies well enough, and for publication I recommend the authors expand this section? Why is it important? Additionally, I find the combined results and discussion section to be a bit brief. The combination results in too little of each, and the discussion especially suffers. There is little discussion of the results in context of other papers that have been published for this area, and no discussion of other nutrient enrichment papers (there have been several of late). Finally, what are the biogeochemical significances of this work, the authors should discuss this.

On a more specific note, the description of the nutrient additions is a little confusing. 1st the full compounds are not given. It is important to know if KNO_3 was added or NH_4NO_3 , the latter would have a very different effect on the phytoplankton community (it is assumed the former was added). Likewise, the final concentrations are not given. I assume the listed concentrations are stock solutions and that the final concentrations are: $[\text{Final}] = [\text{stock}] / 1000 / 2$ (eg. For NO_3 : 2ml of 0.2 M into 4L = 100uM). The authors should list their final concentrations to avoid confusion. Finally, on this point, do you think the results would differ if additions were less? The current additions were close

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to 50x the natural concentrations. Would the results be different if the additions were only 10x natural concentrations?

Lastly, the authors state that changes in community composition towards net- and nanoplankton were the result of high Michaelis-Menton constants. I understand this, but I am not sure the general audience has an understanding of nutrient uptake kinetics and I think a more thorough discussion of this is required. I would also like to point out that the authors did not measure uptake here, and that differences resulting from different nutrient uptake kinetics are presumed. The authors should note this as well.

Specifics requested by BG

Does the paper address relevant scientific questions within the scope of BG? Yes

Does the paper present novel concepts, ideas, tools, or data? Yes, the idea of the importance of downwelling eddies and nutrient limitation- though this is not well spelled out in the paper.

Is the language fluent and precise? The paper needs some editing, but is pretty good.

Overall, I find that this manuscript needs quite a bit of work before it is acceptable for publication. I recommend resubmission of a revised version before acceptance.

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