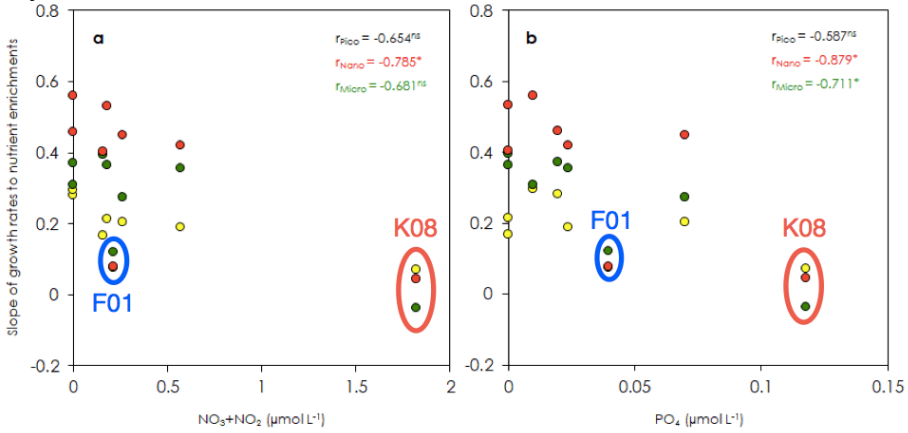
Review Kobari et al 2019 Biogeoscience

This study aims to demonstrate in the Kuroshio area near northern East China Sea, that turbulence-induced nitrate flux can stimulate phytoplankton production in this seemingly oligotrophic ocean, while microzooplankton respond quickly to graze down the phytoplankton. As a consequence, high phytoplankton biomass is not observable. The authors used turbulence and nitrate sensor to demonstrate the nitrate flux, use nutrient enrichment experiments to demonstrate effects of nitrate flux on phytoplankton growth, and dilution experiments to measure microzooplankton grazing. This work is really interesting and deserves publishing in Biogeosciences. I have following comments that aim to help improve this manuscript.

Main concerns:

1. Potential effects of microzooplankton:phytoplankton ratio on the enrichment experiments: Table 1 shows that the chl-*a* and microzooplankton standing stock at the beginning of the incubations varied. The relative abundance of microzooplankton to phytoplankton may change the strength of top-down control. I wonder if adding microzooplankton:chl-a ratio or standing stock of microzooplankton and chl-a density to the regression analysis (Figure 5) can further explain the variation of phytoplankton growth after enrichment.
2. Enrichment experiments that did not exhibit clear effect of ambient nutrient on phytoplankton growth enhancement to enrichment (Lines 161-167 and Figure 5): Indeed there is a negative trend between phytoplankton growth-enrichment regression slope and $[NO_3^-+NO_2^-]$ or $[PO_4^{3-}]$ in control experiments. However, the plankton communities that have small regression slopes and low r^2 ($r^2<0.5$; F01 and K08 in Fig. 5 and Table 1, which I labeled in the figure below) experienced quite different *in situ* nutrient condition, and only K08 seems to drive the negative trend. I would like to know if the negative trend remains after removing these two sets of low-r^2 points. Furthermore, is there any possible explanation why the two incubations under low and high nutrient concentration reacted similarly to nutrient enrichment?



3. "Intra-guild" predation within microzooplankton community (Line 158-160): The results indicate that enrichment slightly increased the growth rate of nauplii but not always increase ciliate growth, especially when enrichment is low. According to the biomass change of the three types of microzooplankton to enrichment, the increase of nauplii is not as significant as ciliates when enrichment is high (Figure 3). I think, maybe the intra-guild predation of ciliates by nauplii inhibit the growth of ciliates when ciliate growth enhanced by low enrichment was not strong enough to compensate their mortality by nauplii feeding. As the enrichment increase further, fast growing ciliates can outgrow the consumption by large nauplii that grow and react more slowly to environmental change,

and thus ciliate growth and biomass accumulation increase. If the body size ratio between nauplii and ciliates in the incubations fit the predator-prey mass ratio of nauplii (Hansen et al. 1994), this is possible to happen.

4. Stoichiometry of nutrient supply in Kuroshio (Lines 82-83): The enrichment and dilution experiments supplied phytoplankton with nitrate and phosphate molar concentration in 15:1 ratio (slightly N-limited, relative to the Redfield ratio 16:1). Did this ratio mimic the inorganic N:P concentration ratio or N:P flux by turbulent mixing in Kuroshio? Since this study focus on the nitrate supply from turbulent mixing, I expect that N should be limited. Nevertheless, I would like to know more about the stoichiometric condition of this study area and its potential effect on phytoplankton growth.
5. I will appreciate data to demonstrate the accuracy of in situ nitrate sensor (e.g. comparing with measurements using water collected by sampling bottles). This issue is particularly important when nitrate concentration is low in the water.
6. English needs substantial polishing to ensure correct grammar and wording. Some sentences are difficult to understand.

Editorial comments:
Abstract:
I have concerns on "rapid trophic transfer" in the title. The authors show evidence of rapid microzooplankton consumption of phytoplankton, but did not show evidence of trophic transfer.
Suggested title:
"Phytoplankton growth and consumption by microzooplankotn stimulated by turbulent nitrate flux suggest rapid trophic transfer in the oligotrophic Kuroshio

The writing of Abstract is confusing. Readers cannot tell what are the results obtained from the experiments, what are the results from other studies, and what are the inferences from those results. I think these issues need to be clearly clarified in Abstract.

Line 29: I cannot understand this sentence, and what the authors intend to say.

Line 31: This conclusion sentence is inference based on the results and should be written as so.

Line 35: “were simulated”

Line 35: “Results of dilution …

Line 37: Please explain what you mean by "invisible".

Introduction
Line 40: I cannot understand what is "originates to".

Line 43: In spite of such “seemingly” unproductive

Line 46: I cannot understand this sentence.

Methods:

Line 78: Please explain the motivation of using nutrient gradient in experiment in this paragraph, so that the readers can follow the logic flow better.

Typically in dilution exp, nutrients were amended in all bottles of the 4 dilution factors. Then, to evaluate whether nutrient limitation exists, additional no nutrient amended exp is conducted for non-diluted bottles (100%). Is this the protocol in the EXPb? Please clarify. If the authors did not follow this protocol, please explain why.

Line 100: Please explain how the chla data from different size fraction was obtained in this section.

Line 120: Please clarify the difference between the C_t in equation (2) and (3). The explanation is confusing.

Results

Line 131: confidence interval of "what"?

Line 136: what is "*O*"? I cannot understand this sentence.

Line 164: Is the "N concentration" the nitrate concentration in the control groups at the start of incubation, i.e. the nitrate concentration in the ambient seawater without enrichment?

Line 179: do you mean "g_{en}'=g_{max}-m"?

Line 184: Do you mean g_{en} here when referring to net growth rate?

Discussion

Line 191: should be ""previous", not previously

Line 225: This sentence is confusing. Previous sentence said that "microzooplankton standing stocks and growths are not elevated".

Line 235: Because microzooplankton growth rate and standing stocks are NOT significantly elevated, I am NOT sure that the authors can conclude the "rapidly transferred to microzooplankton via their grazing".

Figures:

Figure 2a: The unit of the orange curve seems to be the vertical gradient of nitrate, not the concentration. Please confirm whether this is the concentration or gradient curve.

Figure 3b and 4b: Please use a different set of colors or shading to present the microzooplankton data. It is a little bit difficult to recognize the difference between subplots *a* and *b* in these two figures.

Figure 5: The color used to present the r values should be consistent to the color used in Figure 3, 4, and 6 (micro = red, nano = green, and pico = yellow). I found that the colors of the points used in this figure correspond to the right size classes but colors of the captions on

this figure seem not (micro = green, nano = red, pico = black).