

Biogeosciences Discuss., referee comment RC3
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Comment on bg-2021-17

Anonymous Referee #3

Referee comment on "Active and passive fluxes of carbon, nitrogen, and phosphorus in the northern South China Sea" by Jia-Jang Hung et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2021-17-RC3>, 2021

Hung and his/her coauthors focused on the vertical fluxes (CNP) in the northern SCS area. Using several cruises data, they presented active and passive fluxes for CNP vertical transport result. The key findings in their work is the distinguishing of active and passive parts of vertical flux, in comparison to classic sediment trap collected and inferred BP. They found the CNP flux are higher than previously reported BP in open oceans. As they stated, this is likely due to the consideration of active vertical flux.

Hung et al's work present some interesting results, some of which are solid raw data while some other result are clearly inference or estimate (e.g., zooplankton-related flux which are basically calculated via equations). As a result the uncertainties should be large. So in short, I wonder their conclusions. I am attaching my comments and suggestion here.

Major:

- Authors here present a logic behind: what they all estimated in current work are all belonging to BP. But they don't ask readers' idea. What if some readers doesn't agree? To investigate vertical flux is important, but I don't think it is good to changing classic concepts without clarifying it.

- The zooplankton-related vertical fluxes, including gut flux, respiratory flux, excretory flux, mortality flux, how about the uncertainties? I would guess the uncertainties are large. If so, some of the authors conclusion may change accordingly.

- Another question is how to persuade readers that by equations from other sites, the zooplankton-related vertical fluxes are still valid and make sense for the SCS case? For example, the Takahashi 2009 equation is from a subarctic pacific ocean, how can it be applied in the tropical SCS? how can respiration rate be the same between sharp habitat background? Even if yes, this meant large uncertainties, how to access its impact on your presented result and conclusion? I failed to see it.

- It is clear zooplanktons also breath, release, eat, and excrete when they are in upper water columns. Some of them even die (e.g., be grazed by fish) when in the upper water columns. All these activities means that presence of zooplankton in the upper water column also contributes CNP to the upper water column. This is, I guess, in the reverse way the authors are discussing. I guess authors have considered and made calibration against this process. But I failed to see it. Can authors explain this more clearly? How they cancel out this part?

- I have doubts in simply comparing collected zooplankton biomass between day and night net. In addition to vertical migration, how to consider zooplankton lateral migration across slope area along with tide? Quite a few sites are on slope regions as is shown in figure 1. so these sites should be under such impact.

- according to the methodology, I don't think the authors present results are PON, it is acid-rinsed PN. Some ON may be lost during acid rinsing process.

- Vertical fluxes of DOC and DON: though I am not familiar with the way authors did the calculation, why are the authors sure the vertical flux is one-way only (from upper to bottom layer)? How if the upwelling or any other physical process that brings bottom water (hence DOC and DON) to shallower layers? I see usually DOC concentration vertically dropped from surface to bottom waters, but if there is upwell-like phenomenon, how to make sure the down-ward flux of DOM, as present in current work, exists?

- Eddies indeed play an important role in determination of vertical fluxes. Recent work shows that in SCS, the detailed eddy information is also very important in its determination of ecosystem and biogeochemistry. At the edge of warm eddy, it can be upwelling, whereas at the edge of cold eddy, it can be downwelling [1]. The timing of eddy is also important [1]. In current work, the site and timing of eddy information is missing. So it is hard to judge the eddy contribution to vertical flux.

- Line 580 extrapolate the entire SCS via continental-slope-based data should be viewed with caution, as slope region is different from basin area in SCS.

Specific:

Abstract: this sentence is confusing: Vertical fluxes of dissolved organic C, N, and P generally contributed to less than 5% of passive fluxes. In word, this is not logic. What do you mean?

Introduction

Line 49-50: This active transport may not only be important in sustaining the metabolic requirement of mesopelagic community, but also provide partial energy demand of mesopelagic ecosystem---this two aspects are the same thing.

Lack of scientific question in the introduction part

Line136 0.125 lack unit

In offshore regions, SCS water is very clean and less of POM. Would it be enough to measure POC precisely based on only 1.5L of seawater? Authors should present their instrument detection limit accordingly.

Line 227-228¼□Organic matter content was estimated from POC content by a factor of 2. What does this mean?

Line 395 Missing 'than'?

Line 518 bracket wrong

ref.

- Zhou, K., et al., *Transient Enhancement and Decoupling of Carbon and Opal Export in Cyclonic Eddies*. *Journal of Geophysical Research: Oceans*, 2020. **125**(9): p. e2020JC016372.