

Biogeosciences Discuss., referee comment RC1  
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## Comment on bg-2022-196

Anonymous Referee #1

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Referee comment on "Partitioning of carbon export in the euphotic zone of the oligotrophic South China Sea" by Yifan Ma et al., Biogeosciences Discuss.,  
<https://doi.org/10.5194/bg-2022-196-RC1>, 2022

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Ma et al. calculated POC export fluxes at the base of the NDL and Ez, as well as discussed the NDL's nutrient source. The data is treasurable for understanding nutrient dynamics and the carbon cycle. The outcome is reliable, and the manuscript is well-organized. However, some points must be clarified before accepting for publication. There are also a number of typos. My specific recommendations are listed below.

- My biggest concern is about the method calculating the physical transport flux. In eq. 8,  $V$  is part of the tendency term shown in eq. 3. To calculate the horizontal transport flux in the NDL or Ez, it needs to implement an integration over the depth. Whereas, the vertical flux is calculated as the  $wC$ , where  $w$  is the vertical velocity and  $C$  is the concentration of the tracer. It isn't necessary to calculate the "integrated vertical transport flux" over the NDL or Ez as shown in L306. Please recheck your method. I listed some references that introduce the method to calculate transport fluxes. The authors need to introduce how they calculated the horizontal and vertical fluxes clearly.

Palter, J.B., Marinov, I., Sarmiento, J.L., Gruber, N. (2013). Large-Scale, Persistent Nutrient Fronts of the World Ocean: Impacts on Biogeochemistry. In: The Handbook of Environmental Chemistry. Springer, Berlin, Heidelberg.  
[https://doi.org/10.1007/698\\_2013\\_241](https://doi.org/10.1007/698_2013_241)

McGillicuddy, D. J., Anderson, L. A., Doney, S. C., and Maltrud, M. E. (2003), Eddy-driven sources and sinks of nutrients in the upper ocean: Results from a 0.1° resolution model of the North Atlantic, *Global Biogeochem. Cycles*, 17, 1035,  
[doi:10.1029/2002GB001987](https://doi.org/10.1029/2002GB001987)

- In section 4.3.2, the authors calculated the mass balance of 15N (Eqs. 10, 11). In my understanding, PN which denote particulate nitrogen should be interpreted when it occurred for the first time. It is not clear how to calculate the 3 unknowns ( $F_{pn}$ ,  $F_{no_3}$ ,  $F_{air}$ ) in two equations. Please introduce the calculation carefully.
- The authors discovered that horizontal transport flux accounts for 20% of total flux. However, the fraction is not negligible. Some stations were shown to be influenced by eddy activities. It is worthwhile to consider the horizontal transport of eddies whose effect is not only vertical. There are some studies discussed the horizontal transport of particles in eddies e.g. Wang et al., 2018 <http://dx.doi.org/10.1029/2017JC013623>, Ma et al., 2021, <http://dx.doi.org/10.1016/j.pocean.2021.102566>. Can you separate the nutrients trapped in the cyclonic eddy and transported with the eddy (horizontal transport) and local uplifted nutrients (vertical transport)? Stations B1 and C2 may be affected by the upwelling off the coast of Vietnam.

Minor concerns:

- L36: Siegel et al., 2021
- L41-42: Need references
- L53: the references are not recent ones. Don't use the word recently.
- Figure 1: Denote the shading and add a color bar
- Please consider to make a new table to show the location, water depth, sampling depth, sampling time etc.
- Eq. 3 is the same as Eq. 1.
- The font is too small in Figure 4.
- Eq9. What's the  $\Delta x$  and  $\Delta y$ .