

Comments

Thank you for your submission to the Ocean Science Discussion. While the observations you report can be of interest, I find the analysis short of qualifying a scientific article. The manuscript is highly descriptive, and no detailed analysis or convincing discussion is presented. The material would be more appropriate for a (very good) report or a data description paper. Following my comment and the comments from two reviewers, please post an authors' response that outlines how you intend to improve the study (e.g., which additional analysis and revisions you intend to do). At this stage I do not encourage you to prepare a full revised version for submission to Ocean Science, but to summarize how you intend to proceed. Please allow me to decide based on your response.

The observations from two sections (one section with 6 stations and a second section with 9 stations) are presented as distance-depth distributions, like a data report: one figure for hydrography, one figure for the turbulence measurements and one figure for the water samples (Chl-a, nutrients and phosphate concentration). The next figure combines the diffusivity with concentration gradient to obtain the turbulent fluxes. The final figure implies curl-driven upwelling can be important, but it is introduced in passing and not a convincing analysis is presented. Overall, one section is turbulent and the other is not turbulent. Narrative repeatedly compares the two sections in various parameters.

Responses: Thanks for your comment and advice. We have carefully revised the manuscript based on the reviewers' comments. Most of the previous studies on the South China Sea focused on the effects of upwelling, coastal currents, eddies and typhoons on the nutrients and chlorophyll. In this manuscript, we investigated the effects of turbulent mixing on nutrients and chlorophyll. We found the unevenly distributed turbulent mixing has different impacts on the distribution of nutrients and chlorophyll. It is important to our understanding of the impact of turbulent mixing on biological processes, which will draw attention to the biophysics of the South China Sea. Our research is a preliminary study. In the near future, more detailed and longer-term data are needed to study the effects of turbulent mixing on the nutrients,

chlorophyll and primary productivity in space and time.

Some minor comments: The observation period is given as approximately 1 month from late April to late May; however, which days the sections were collected are not stated. If the sections are separated by several weeks, the role of temporal variability
35 could be discussed.

Responses: Thanks for your comment and advice. We have added the date to the text and discussed the role of temporal variability (lines 98-106 and 385-395).

Descriptive occurrence of internal wave packets from satellite images (Zhao et al 2004) are from a different year. More convincing case could be made presenting
40 actual observations from the cruise period.

Responses: Thanks for your comment and advice. The internal wave packets occur every year and are extensive in the northern SCS. To make the article more rigorous, we delete the internal wave packets from Figure 1 and replaced them with sea surface chlorophyll a (line 89).

45 Please make sure to use same units, for example nitrate fluxes are given in $\text{mmol N m}^{-2} \text{ s}^{-1}$ in line 43 and $\text{micromole m}^{-2} \text{ s}^{-1}$ in line 46. Throughout, is it correct to refer to CTD as hydrological data?

Responses: Thanks for your advice. We have used the same units in the revised text (lines 47-50). Yes, CTD data are hydrological data.

50 What acoustic frequency is the ADCP?

Responses: The frequency of ADCP is 38 kHz. We have clarified this in the revised text (lines 115-117).

Li 110, fine scale shear variance is introduced right after the microstructure shear variance. This can be confusing for the reader.

55 Responses: Microscale shear was collected by TurboMAP and was used to calculate the dissipation rate. Finescale shear variance was calculated with the finescale velocity obtained from shipboard ADCP. We have clarified this in the revised text.

Please use standard notation for potential temperature and potential density anomaly.

Please do not use psu for salinity unit. Indicated that it is practical salinity, given on

60 practical salinity scale (no units).

Responses: Thanks for your advice. We have removed the units in the text (line 180).

Li 129-130: salinity layers are identified in brackets in density ranges. This is confusing. At least clarify that the values are density.

65 Responses: Thanks for your advice. We have clarified the values in the revised text (lines 168-170).

Ri at 16-m vertical scale does not resolve the turbulence processes. It can be removed all together. Citing that previous literature reported Ri from 2m to 16 m vertical scale does not help (li 115).

70 Responses: Thanks for your advice. We have deleted the content of Ri in the revised text (line 247).

In Fig 8, are the two separate parts around section A and B. I assume these are 3-day averages for days corresponding to the section time periods (i.e. you created a mosaic from two images). If so, please clarify in the caption and in the text.

75 Responses: Thanks for your advice. We have clarified in the caption and in the text (lines 355 and 362).