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Interactive comment on "The Influence of Turbulent Mixing on the Subsurface Chlorophyll Maximum Layer in the Northern South China Sea" *by* Chenjing Shang et al.

Anonymous Referee #1

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The article analyses two transects in the South China Sea conducted with CTD, turbulence profiles and ship board ADCP measurements. The authors focus on the transport mechanisms of nutrients through vertical turbulent mixing. The main results are strong differences between the two transects: the transects nearer to the Luzon Strait exhibits a much more patchy but also stronger turbulence and subsequently stronger vertical nutrient flux compared to the transect further away. The authors finish the article with this conclusion, which I find a bit weak and would expect more discussion, in the current form it is more a technical document describing a measurement. Possible questions which arise automatically could be: What are the consequences on biogeochemistry of this spatial inhomogeneity? Do satellite picture show also inhomogenities in chl-a? Is

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the part nearer to the Luzon strait more/less productive? Maybe less/more fish catch? The introduction is lacking a section explaining the mechanisms of the evolution of chl-a. What are the sources/sinks, where are they and why are the authors at all interested in chl-a? Also the methodology needs some improvement, the authors do not describe the dates of the measurements, nor the meteorological situation. Also the processing is somewhat unclear, were the devices calibrated? What software was used to derive the dissipation rate? The computation of the fluxes does as well need a second look: As it is unclear what the time difference between the CTD and the turbulence profiles is, it is unclear how much error is induced by the time difference between the sampling. Transect B suggests by its patchiness a strong temporal and or spatial inhomogeneity, which has possibly a huge impact on the fluxes. The authors need to discuss this issue. On the other hand transect A has low turbulence O(1e-9 Wkg-1), a quick glance at the Buoyancy Reynolds number (eps/(N**2 nu)) at distance = 150 km, depth 50 m with eps$\sim$1e-9, N**2$\sim$4e-1 and nu$\sim$1e-6 gives a Reb = 2.5, suggesting values well below 10, in this region turbulent mixing is strongly damped or completely suppressed by stratification and fluxes are molecular. It is therefore necessary to compute Reb and to mark (or discard) regions of low Reb. Without being an natural English speaker, my impression is, that the English needs some improvement as well.

Despite these criticisms, this is a very valuable dataset and is worth publishing.

Detailed comments.

Figure 1: Add a subplot showing the region on an overview map, include in the subplot also the location of the western pacific mentioned in line 129.

Introduction: 30-51: Nutrient fluxes: where do the nutrients come from and were are they mixed/cponsumed/transported

81: Add date of last calibration

88-89: Add ADCP frequency and sampling intervals of the ADCP

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100: Include a description of the software package used to calculate the dissipation rate.

Figure 2: Include the station number and date of measurement into the figure label

118: Detail in more detail how the interpolation of the high resolution T,S to eps was done

Data & Methods: It does not become clear when and how many profiles were taken. Was i.e. only one turbulence profile taken at the stations A1-A6 and B1-B9 or several? How were the meteorological conditions? Do tides play a role, was it spring/neap tide?

Figure 4: Add markers of the CTD/TurbMAP profiles

161-162: "Internal waves might play an important role in mixing the local and invasive waters (Alford et al., 2015).": This is not an result and better belongs into the introduction

171-172: What about local wind conditions? It could be argued that transect B was measured after a storm event, mixing the whole upper water column.

192: Figure 5 suggests O(10-7)

193-194: Transect B compared to transect B?

194-195: Is there evidence in measured data (i.e. ADCP) that internal waves are the main process, otherwise this is speculation (a reasonable though) and the sentence should be rephrased.

Figure 5b: One could argue that the profiles were taken with/without internal wave activity and thus creating the strong variability and patchiness of the data. Is there a way to estimate the internal wave activity during the profile? Add also markers for the locations of the profiles.

Figure 6: How do the oxygen profiles look like? Do they show similar patterns? 267:

Fluxes can be directed upwards/downwards, in the figure it is log10(flux). Add description of calculation

306: What does "maintaining" mean? The nutrient flux causes a growth of chl-a containing organisms, what processes cause a decay?

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