

## ***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 #2**

Received and published: 7 July 2020

The Influence of Turbulent Mixing on the Subsurface Chlorophyll Maximum Layer in the Northern South China Sea by authors: Chenjing Shang et al. MS No.: os-2020-26

This manuscript considers biophysical implications of internal waves in the South China Sea using combined turbulence and nutrient data. While it is quite descriptive, the region and dynamics are very interesting and the results appear well-structured and can be considered in a wider context of other studies in the region. My general comment is it needs to clarify if it is a study about the generalities of SCM or is it primarily the biophysics of the South China Sea area? And the conclusion that a more turbulent region does more to diffuse and scatter a layer of increased productivity is not as clear

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and strong as it could be.

In terms of language and grammar, while the text is readable and meaning is generally clear, there are many awkward or incorrect wordings/structures/spellings that a language edit would quickly clean up and make for a much easier read.

### **Introduction**

This section consists of two quite dense paragraphs. I think these could be broken up and expanded on a. In the first paragraph I wanted to know more about horizontal variability. In the second I wanted to know more about the region – e.g. the actual location Figure is not referenced until the Methods section.

Line 52-on - as above it would be good to clarify if it is a study about the generalities of SCM or is it primarily the biophysics of the South China Sea area?

Line 62 – here and elsewhere values for dissipation rate are quoted. It would be good to get some sense of if these are average values or peak. This is especially true for internal wave driven processes which are typically sporadic – or at least spatiotemporally variable.

Line 71-73 It would benefit from a clear statement about the scientific question(s). Presently “In this study, the microstructure, Chl-a, and nutrient data obtained from two transects of the northern SCS are used to investigated the impact of turbulent mixing on the distributions of nutrient and Chl-a.” seems quite vague. The material here has the building blocks of actual scientific questions, but they are not articulated. Is it all about internal waves? Are their horizontal nutrient gradients too? What are the temporal dynamics if it is internal wave mixing and this peaks for only a few hours every tidal cycle and shifting in/out of phase with daylight?

Also, some later material on mixing parameterisation (lines 210-) might be better here or methods.

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## Methods

Fig 1 – a zoom out would help locate for the unfamiliar. Also – how extensive are the results of Zhao et al. 2004 – do internal waves never penetrate to transect A?

Line 88 what frequency ADCP?

Line 94: Turbomap – I didn't think this was a Rockland Product.

Line 109-116 Turbulence analysis – there are some quite sophisticated and widely used methods for this. Were they used? Various references by Lueck, Wolk and colleagues look at vibration limit identification and replacement of the missing spectral region. Why was 1 m chosen as bin size?

Line 122 – “time interval of turbomap”? You mean the individual profiles of the full sampling period?

## Results

There are many brief statements here that would better fit in the Discussion in a more expanded form. E.g. lines 161-162, 178-179

Line 190-191 – better placed into methods.

Lines 210-on The Gradient  $Ri$  gets introduced here which seems strange. It is not clear why it is required as there exists direct measures of turbulent mixing? Saying that, I do see the point about high vs low shear and stratification.

## Discussion

This section is unstructured and would benefit from some clear themes building from the introduction. I think this needs significant work to give it structure and better bring together the results.

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Lines 260-262 - Instead it starts with some Introductory material.

Line 260 “chaotic”? Is it actually chaotic or under-sampled? Under-sampling is inevitable in some situations so it is important to be clear. Do we have any sense of nutrient spatial variability beyond the transect data? e.g remote sensing or is the suggestion that these data are of limited use due to the subsurface biological processes?

Lines 359-375 - I don't really see the need for separate conclusions especially as they have much in common with abstract.

Can you plot biological production as a function of the nutrient flux in a way that shows how the two transects differ/compare?

Can you develop some kind of regime diagram where we have internal wave activity, nutrient availability and wind/upwelling and somehow present your findings for production in these terms?

Seasonality gets a minor mention but it would be useful to discuss more fully how these present results could/would translate through the annual cycle.

## Minor

Potential temperature – some confusing notation and labelling – be good to be clear and use the accepted symbolic notation for potential temperature  $\theta_0$ .

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Interactive comment on Ocean Sci. Discuss., <https://doi.org/10.5194/os-2020-26>, 2020.

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