Dear Editors and Reviewers:

Thank you for your letter and for the reviewers' comments concerning our manuscript entitled "Vertical stratification-driven nutrient ratios regulate phytoplankton community structure in the oligotrophic western Pacific Ocean" (ID: os-2021-67). Those comments are all valuable and very helpful for revising and improving our paper, as well as the important guiding significance to our researches. We have studied comments carefully and have made correction which we hope meet with approval. Revised portion are marked in red in the paper. If there is anything else we should do, please don't hesitate to let us know. Again, we deeply appreciate your efficient and professional review of our manuscript. The main corrections in the paper and the responds to the reviewer's comments are as flowing:

Responds to the reviewer's comments:

Reviewer #1:

General aspects

This paper reports the Utermöhl plankton in the Tropical West Pacific at almost identical stations across latitudes from the equator to 20°N., in the autumn of three successive years, 2016, 2017 and 2018, aboard the flagship of the PLC's ocean research fleet, the R.V. Keshue. Identification was reported only according to broad groups. Samples were taken throughout the water column from 5 to 200 m. Over an essentially 2D transect from south to north, with a minor dog leg north of the Philippines.

Response: Dear Reviewer, thank you very much for your kind letter and encouragement. We also appreciate the time and effort that you have dedicated to providing valuable comments and suggestions, which helped us to improve the quality of our manuscript significantly. We have carefully studied these insightful comments and have made corrections which we hope meet with your approval. In this paper, we identify reported only according to broad groups. Because our study found that the correlation of phytoplankton with VSI and physicochemical factors was more intuitively expressed at the phylum level in the study area. We wanted to express this scientific question prominently, so we did not discuss community diversity in detail. All identified species belong to four phyla (Bacillariophyta, Dinophyta, Cyanophyta, and Chrysophyta).

The taxonomic and physico-chemical data were explored by several statistical tools, the Structural Equation Model (SEM), PCA, RDA, and Bray-Curtiss Analysis. As well

as fitting the standard physico-chemical parameters of nitrate, nitrite, phosphate, silicate, T and S, the authors systematically computed a Vertical Stratification Index (VSI), including this parameter in statistical treatments.

Response: Dear Reviewer, we would like to express our great appreciation to your time and effort in reviewing our manuscript, and your insightful and constructive comments helped to improve the accuracy and quality of our manuscript significantly.

The paper presents: T/S data as x-y surface and x-z sections for each of the 3 years (Fig. 2); variation in VSI from south to north over the 3 years (Fig. 3); surface phyto abundance (Fig. 4); x-z distribution of phyto abundance over 3 years (Fig. 5); broad taxonomic relative abundance distribution (dinos, diatoms, cyanos, chrysos) over all stations, pooled for the 3 years (Fig. 6), 2D PCA diagram of the stations (Fig. 7); 2D RDA diagrams (Fig. 8). These analyses are used by the authors to show clearly that the study area divides into 4 groups, A, B, C and D. In Fig 9 whisker boxes are used to show the distribution of T, S and VSI in each group, which is a very nice feature, and very clearly presented. Fig. 10 is used to present results of the SEM, indicating the statistically computed quantified effects (apparent effects?) of T and S on VSI (of course) and of T, S and VSI on DIN, DIP and phytoplankton. This is very original, as far as I am aware. Fig. 11 is used to explore the effects of DIN and DIP (particularly the N:P ratio, on phytoplankton of the four major taxa in the 4 regions at 3 depths (surface, DCM, and 200 m). It clearly shows different effects of N and P on the phytoplankton community structure in the different ecosystems corresponding to these three chosen depths.

There follows a Discussion rich, original and well argued.

Response: Dear Reviewer, thank you very much for your professional and careful review of our manuscript and for giving constructive comments.

However, in contrast to all this quality the introduction is terrible, and totally inappropriately targeted. While the authors have done an excellent job for the Methods, the Results and the Discussion, they need to scrap the Introduction completely and write it again. The same goes for the Abstract. If this is done well, this manuscript would constitute an important and original contribution.

Response: Dear Reviewer, thank you very much for your professional and careful review of our manuscript and for giving constructive comments. As your suggestion, we have reworked the abstract and introduction sections. Please refer to our revised

manuscript.

Specific aspects

Title

OK

Response: Dear Reviewer, thank you very much for your approval and encouragement.

Abstract

TERRIBLE.

Response: Dear Reviewer, we are very sorry for our poor description. As your suggestion, we have carefully reworked the abstract section of our manuscript in the revision process.

Introduction

TERRIBLE. (See above).

Response: Dear Reviewer, we are very sorry for our poor description. As your suggestion, we have carefully reworked the introduction section of our manuscript in the revision process.

Materials and Methods

THIS SECTION IS MOSTLY EXCELLENT.

Response: Dear Reviewer, thank you very much for your kind approval and encouragement.

P3L26 “PE” > “polyethylene”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “PE” into “polyethylene”.

P4L11 Insert reference for the Utermöhl method.

Response: Dear Reviewer, thank you very much for your professional and careful review of our manuscript and for giving constructive comments. We inserted the reference for the Utermöhl method.

L11-20 In this section state the minimum size of organisms identified and counted

Response: Dear Reviewer, thank you very much for your valuable and constructive

comments. The minimum size of the organisms identified and counted is 20 μm.

L23 “AA3 (SEAL., German(y)” Give bibliographic reference or web site.

Response: Dear Reviewer, thank you very much for your professional and careful review of our manuscript and for giving constructive comments. We added bibliographic references and rewrote the sentences. “The Technicon AA3 Auto-Analyzer (Bran + Luebbe, Norderstedt, Germany) based on classical colorimetric methods was used for the analysis and determination nutrient (Grasshoff et al., 2009).” Grasshoff, K., Kremling, K., Ehrhardt, M. (Eds.).: Methods of Seawater Analysis; John Wiley & Sons: Hoboken, NJ, USA; ISBN3-527-29589-5, 2009.

P5L15 “average” of temperature and salinity: give the precise dataset for which the average was computed.

Response: Dear Reviewer, I apologized for any inconvenience caused to your review, due to my clerical error. We are very sorry for our poor description, we have reworded the sentence “S and T are the salinity and temperature, respectively, and Sref and Tref are the temperature and salinity at 5 m, ΔT is equal to 0.5 °C.”

L28 “the three years”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “for three years” into “the three years”.

Results

THIS SECTION IS MOSTLY EXCELLENT.

Response: Dear Reviewer, thank you very much for your kind approval and encouragement.

P7L9 “the same” > “a similar”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “the same” into “a similar”.

P8L5 Delete “variation in” (repetition)

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have deleted “variation in”.

L12 “variability” > “variation”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “variability” into “variation”.

L16 “showed a relatively uniform” > “varied little from year to year in their”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “showed a relatively uniform” into “varied little from year to year in their”.

L17-18 “extending...” > with a minor abundance peak at about 10°N.”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “extending in latitude, especially between the equator to 10 °N” into “with a minor abundance peak at about 10°N”.

L18-19 “The abnormally...” > “This abundance peak was associated...”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “The abnormally high phytoplankton abundance in this region is associated” into “This abundance peak was associated”.

L20 “observed also...”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “observed” into “observed also”.

L21 “in southern Taiwan” > “south of Taiwan”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “in southern Taiwan” into “south of Taiwan”.

P9L1 Delete “As can be seen from the figure,”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We deleted “As can be seen from the figure,”.

L3 “regional variations in latitude” > “variations with latitude”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “regional variations in latitude” into “variations with latitude”.

L5-6 Delete “, and...” (Repetition)

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We deleted “and phytoplankton abundance gradually decreased with increasing latitude”.

L11-13 “...the lower phytoplankton abundance was mostly dominated by...”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “the phytoplankton abundance was lower than that in” into “the lower phytoplankton abundance was mostly dominated by”.

L19 “... little interannual difference between species, ...”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “little difference in interannual changes between species,” into “little interannual difference between species,”.

L26 “4.8” > “4.8%”; “1.4” > “1.4%”

Response: Dear Reviewer, we are very sorry for your confusion due to our poor description. We rephrased the sentence “The species ratio of diatoms to dinoflagellates in Group A (dias: dinos = 4.8) was higher than that in Group B (dias: dinos = 1.4).”

L29-30 Delete “The horizontal..” It’s already marked on the figure 7.

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We deleted “The horizontal and vertical axes explain 51.87% and 21.41% of the phytoplankton community structure, respectively.”.

P11 L14 “methanogens” This seems to be a mistake.

Response: Dear Reviewer, I apologized for any inconvenience caused to your review, we have revised “methanogens” into “dinoflagellates”.

L26 Insert “here,” before “the phytoplankton”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We inserted “here,” before “the phytoplankton”.

P12L6 “3.4” > “3.6”

Response: Dear Reviewer, I apologized for any inconvenience caused to your review, we have revised “3.4” into “3.6”.

L8 “... of the sample from 5 m above” Seems to be a spurious insertion. Delete.

Response: Dear Reviewer, thank you very much for your professional and careful review of our manuscript and for giving constructive comments. We are very sorry for your confusion due to our poor description, we deleted “... of the sample from 5 m above”.

L12-13 “The strong spatial variability...” > “Fig. 9 shows clear variation in T-S.”.

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “The strong spatial variability of T-S was evident from the characteristics of salinity and temperature.” into “Fig. 9 shows clear variation in T-S.”.

L14-15 “number of VSIs” > “values of VSI”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “number of VSIs” into “values of VSI”.

L15 “was > “were”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “was” into “were”.

L16 Delete “There were... groups”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We deleted “There were obvious differences between the four groups; that is,”.

L18 “linearly fitted to temperature” > “related to temperature”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “linearly fitted to temperature” into “related to temperature”.

L19 Delete “The fitting results showed that the”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We deleted “The fitting results show that the”.

L20-21 Delete “It can be noted that the”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We deleted “It can be noted that the”.

L21 “more” > “most”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “more” into “most”.

P13L7 “3.6” > “3.7”

Response: Dear Reviewer, I apologized for any inconvenience caused to your review, we have revised “3.6” into “3.7”.

L7 “parameter” > “parameters”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “parameter” into “parameters”.

P14L14 At the end of this light you may like to add, “and growth may have become increasingly limited by light.”

Response: Dear Reviewer, thank you very much for your professional and careful review of our manuscript and for giving constructive comments. As your suggestion, we added “and growth may have become increasingly limited by light.” to this section. Thank you again for your valuable comments!

Discussion

VERY GOOD DISCUSSION.

Response: Dear Reviewer, thank you very much for your kind approval and encouragement.

P15L1 “Kuroshio” > “The Kuroshio”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “Kuroshio” into “The Kuroshio”.

L1 “WPWP” Add this to Fig. 1.

Response: Dear Reviewer, thank you very much for your valuable and constructive

comments. We added “WPWP” to the Fig. 1.

L1 After “interaction” insert “and climate modulation”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We inserted “and climate modulation” after “interaction”.

L14 “the vertical trawl” > “vertical hauls”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “the vertical trawl” into “vertical hauls”.

L24 “acquisition of nutrient strategies” > “nutrient acquisition strategies”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “acquisition of nutrient strategies” into “nutrient acquisition strategies”.

L25-26 “... dinoflagellates use mixotrophy, engulfing prey as well as feeding using peduncles and palia, while phosphorus...”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “…dinoflagellates have the ability of mixotrophy, and the mixotrophic modes of dinoflagellates include direct engulfment of prey, peduncle feeding, and pallium feeding, and phosphorus…” into “…dinoflagellates use mixotrophy, engulfing prey as well as feeding using peduncles and palia, while phosphorus…”.

L28 “was > “is”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “was” into “is”.

P16L2 “Fig. 11” > “Fig. 6”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “Fig. 11” into “Fig. 6”.

L3-4 “... has already been demonstrated (Grosskopf et al., 2012; ...”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “…has been demonstrated several years ago” into “... has

already been demonstrated".

L4 "The presence of slight" > "The virtual absence"

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised "The presence of slight" into "The virtual absence".

L9 "were" > "are"

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised "were" into "are".

L9 "susceptible" > "affected"

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised "susceptible" into "affected".

L11 "across" > "along"

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised "across" into "along".

L12 "indicated" > "indicates"

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised "indicated" into "indicates".

L13 "indicated" > "indicates"

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised "indicated" into "indicates".

L16 "competition is reduced as light limitation kicks in, and the nutrient ratio approaches...

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised "competition reduced and the nutrient ratio approached" into "competition is reduced as light limitation kicks in, and the nutrient ratio approaches".

L17 "nutrients partly affected..." > "nutrient ratios thus affect..."

Response: Dear Reviewer, thank you very much for your valuable and constructive

comments. We have revised “nutrients partly affected” into “nutrient ratios thus affect”.

L20 Around here, it might be good to very briefly mention the possibility of limitation by other nutrients such as iron. Also mention, if you like, that some of the phytoplankton sampled may have recently sunk from upper layers, and therefore represent the nutrient rations and T-S of these layers. You, the authors, may have a feeling for this in the present work.

Response: Dear Reviewer, thank you very much for your professional and careful review of our manuscript and for giving constructive comments. We have added relevant content in this section “Iron is essential for the synthesis of nitrogen-fixing enzymes in *Trichodesmium*, and *Trichodesmium* have a higher demand for iron than other planktonic organisms. The main source of iron in open ocean is atmospheric deposition. Duce et al. showed that the flux of iron deposition is higher in the WPO, so iron is an important environmental limiting factor for the growth of *Trichodesmium* after temperature (Duce and Tindale, 1991). And we suggest that some of the sampled phytoplankton may have recently sunk from the upper layers and therefore represent nutrient rationing and T-S in the water layers. Directly sinking phytoplankton cells are major contributors to surface carbon export and an important component of ocean carbon sink (Boyd and Newton, 1999). The phytoplankton cells can regulate their sinking rates in a variety of ways, such as the physiological state of themselves (Eppley et al., 1967), morphology of themselves (Pitcher et al., 1989), light (Bienfang, 1985) and environmental factors such as temperature and nutrients (Titman and Kilham, 1976).

L22-24 Delete “With global... structure”. It’s too speculative.

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have deleted this sentence.

L24 Delete “typical”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have deleted “typical”.

L24 “severe” > “strong”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “severe” into “strong”.

L25-28 "... the interannual variation of phytoplankton was not significant. It remained stably oligotrophic, and the vertical stratification structure determined that of environmental resources such as nutrients, thus forming four contrasting environments, each with its characteristic phytoplankton community structure." [I think you can't say that stratification produced the T-S environment. In any case there is no need to say it.]
Response: Dear Reviewer, thank you very much for your professional and careful review of our manuscript and for giving constructive comments. We apologize for the inconvenience caused to your review and we have reworked the sentence according to your suggestion. Thanks again for your professional and careful suggestions.

L31-34 "... from the deep layer below the thermocline, which affects the N:P ratio, and restricts vertical migration as well as physiologically affecting the vertical structure of phytoplankton growth and mortality."
Response: Dear Reviewer, we are very sorry for our poor description. As your suggestion, we have carefully reworked the sentence. Again, we deeply appreciate your efficient and professional review of our manuscript.

L37 "has been" > "is"
Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised "has been" into "is".

L38 Delete "since the 1960s"
Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have deleted "since the 1960s".

L39 "is suitable for living" > "thrives"
Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised "is suitable for living" into "thrives".

P17L1 "Trichodesmium" needs italics
Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We italicized "*Trichodesmium*".

L2 "believe" > "have proposed"
Response: Dear Reviewer, thank you very much for your valuable and constructive

comments. We have revised “believe” into “have proposed”.

L4 “believe” > “suggest”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “believe” into “suggest”.

L5 “also is consistent”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “is consistent” into “also is consistent”.

L6 “where the temperature was not restricted,” > “where the surface temperatures all exceeded 20°C,”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “where the temperature was not restricted,” into “where the surface temperatures all exceeded 20°C,”.

L7 “higher than in those with lower temperatures”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “higher than that at relatively low temperatures” into “higher than in those with lower temperatures”.

L8-21 based on the data you present and other knowledge, the present referee is not entirely convinced by the authors’ arguments, but the authors should have the right to interpret their data in this way if they so choose.

Response: Dear Reviewer, we are very sorry for our poor description. As your suggestion, we have delated the inappropriate description and reworked the sentence “Temperature not only directly affected phytoplankton growth, but also indirectly affected phytoplankton growth and abundance by regulating VSI to drive the nutrient ratio (N:P) (Figure 10).”. Again, we deeply appreciate your efficient and professional review of our manuscript.

L10 “high-value area” > “high abundance”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. According to your suggestion, we have redescribed this section so that “high-value area” has been deleted.

L20 “severe” > “strong”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. According to your suggestion, we have redescribed this section so that “severe” has been deleted.

L25-27 “A strong coupling exists among the nutrient supply rate, the photosynthetic performance of phytoplankton (Bouan et al., 2006), the phytoplankton biomass and primary production, particularly in eutrophic areas (Richardson et al., 2019).” Delete “which directly limits nutrient supply”

Response: Dear Reviewer, thank you very much for your insightful and constructive comments. As your suggestion, we have reworked the sentence and deleted “which directly limits nutrient supply”. Thank you again for your valuable comments!

L28 “causes” > “effects”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “causes” into “effects”.

L28 “in” > “on”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “in” into “on”.

L34 “which” > “and”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “which” into “and”.

L35 “demonstrated” > “demonstrate”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “demonstrated” into “demonstrate”.

L37 Delete “the survival of”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have deleted “the survival of”.

L38 “poor activity” Do you mean “low mobility”?

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “poor activity” into “low mobility”.

L38-39 “in the circulation and water with high nutrient content” > “in mixed water with high nutrient content”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “poor activity” into “low mobility”.

L40 After “C and D regions”, insert “(Fig. 9b)”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have inserted “(Fig. 9b)” after “C and D regions”.

L40 “the” > “relative”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “the” into “relative”.

L41-43 I don’t understand what you mean in this sentence.

Response: Dear Reviewer, we are very sorry for your confusion due to our poor description. We wanted to express that dinoflagellate have more abundance in Groups C and D with weaker vertical stratification. We deleted this sentence due to our inaccurate description.

P18 L4 Delete “which was not discussed in this article”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have deleted “which was not discussed in this article”.

L5 “further investigated”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “future studies” into “further investigated”.

Conclusions

P18L9 Delete “typical”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have deleted “typical”.

L14 “variability” > “variation”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “variability” into “variation”.

L15 “Structural Equation Model (SEM)”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “SEM” into “Structural Equation Model (SEM)”.

L17 After “oligotrophic”, insert “sea area”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have inserted “sea area” after “oligotrophic”.

Acknowledgements

L26 “We thank”

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “Thank” into “We thank”.

References

I not that given names and family names are inverted in the first reference ,“Mitra, A. and Flynn, K.J.”. Please check all references.

Response: Dear Reviewer, we are very sorry for our poor description. As your suggestion, we have carefully checked all references.

Figures, Tables

The figures and tables are all very good.

Response: Dear Reviewer, thank you very much for your kind approval and encouragement.

Fig. 7 needs more contrast.

Response: Dear Reviewer, we would like to express our great appreciation to your time and effort in reviewing our manuscript, and your insightful and constructive comments helped to improve the accuracy and quality of our manuscript significantly. We adjusted the color scheme in Figure 7 in hopes of increasing the contrast.

Special thanks to you for your good comments!

Dear Editors and Reviewers:

Thank you for your letter and for the reviewers' comments concerning our manuscript entitled "Vertical stratification-driven nutrient ratios regulate phytoplankton community structure in the oligotrophic western Pacific Ocean" (ID: os-2021-67). Those comments are all valuable and very helpful for revising and improving our paper, as well as the important guiding significance to our researches. We have studied comments carefully and have made correction which we hope meet with approval. Revised portion are marked in red in the paper. We have a small doubt that maybe Reviewer #2 saw our first-versions manuscript instead of the revised-versions manuscript in this review process. This must be our cause that our revised-versions manuscript is not conspicuous enough, and we hope that we will have the opportunity to present the revised draft to Reviewer #2 in this time. If there is anything else we should do, please don't hesitate to let us know. Again, we deeply appreciate your efficient and professional review of our manuscript. The main corrections in the paper and the responds to the reviewer's comments are as flowing:

Responds to the reviewer's comments:
Reviewer #2:

Page 1 Line 40 heat chain is a new word for me. Please check whether there is this word in oceanography.
Response: Dear Reviewer, thank you very much for your kind letter and encouragement. We also appreciate the time and effort that you have dedicated to providing valuable comments and suggestions, which helped us to improve the quality of our manuscript significantly. We have carefully studied these insightful comments and have made corrections which we hope meet with your approval. We are very sorry for our poor description. We have a small doubt that maybe Reviewer #2 saw our first-versions manuscript instead of the revised-versions manuscript in this review process. This must be our cause that our revised-versions manuscript is not conspicuous enough, and we hope that we will have the opportunity to present the revised manuscript to Reviewer #2 in this time. These issues appeared in the first-versions manuscript and have been revised in our revised-versions manuscript. As your suggestions, we have carefully reworked the introduction section of our manuscript in the revision process. We have deleted these incorrect statements.

Page 2 line 10-12, this sentence is not complete. Line 15 wind-induced, here strange English. Line 19 thermal slope, please check.

Response: Dear Reviewer, I apologized for any inconvenience caused to your review. We are very sorry for our poor description. As your suggestion, we have carefully reworked the introduction section of our manuscript in the revision process. We have deleted these incorrect statements.

Page 3 line 7, Kexue. Sampling dates of the three cruises were preferred. Line 10-12, unreadable. Line 25, unreadable.

Response: Dear Reviewer, thank you very much for your professional and careful review of our manuscript and for giving constructive comments. As your suggestion, we have reworked this section "This study relied on the shared voyage of the WPO (0–20 °N, 120–130 °E), commissioned by the National Natural Science Foundation of China. Physical, biological, chemical, and geological surveys were carried out from September to November in 2016, 2017, and 2018 aboard the R/V *Kexue*. The sampling stations used in this study are shown in Figure 1; the sampling layers were 5, 25, 50, 75, 100, 150, and 200 m. Phytoplankton samples from different water layers were placed in 1 L polyethylene bottles, fixed in formaldehyde solution (3%), and stored in dark. Nutrient samples from different layers were placed in PE bottles, frozen, and stored at −20 ℃ for laboratory nutrient analysis."

Figure 1, the small figures a b c d were not explained. STCC, NEC etc were not explained. I did not find red, yellow and green triangles and black dots in this figure.

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. As your suggestion, we have reworked the description of Figure 1 "Figure 1. Stations in the western Pacific Ocean (WPO) of three cruises. (a): Current systems of the WPO; (b), (c), and (d): sampling stations of 2016, 2017 and 2018 cruises, respectively. The station at 130°E forms the section A, and the station at 20°N forms the section B. Map of the WPO shows the major geographic names and the surface currents, including the Subtropical Counter Current (STCC), the North Equatorial Current (NEC), the Northern Equatorial Counter Current (NECC), the South Equatorial Current (SEC), the New Guinea Coastal Current (NGCC), the Mindanao Current (MC), the Mindanao Eddy (ME), the Halmahera Eddy (HE).".

Figure 5. a b c d were not explained. What is the dots, lines in each small figure?

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have deleted the original Figure 5 and replaced it with Figures 4 and 5 in the new manuscript to better show the horizontal and vertical distribution of phytoplankton abundance in space.

Table 3, Date should be month.

Response: Dear Reviewer, thank you very much for your valuable and constructive comments. We have revised “Date” into “Month” in the Table 3.

References. All the references listed were not aligned by alphabetic order. Strange.

Response: Dear Reviewer, we are very sorry for our poor description. As your suggestion, we have carefully checked all references.

Special thanks to you for your good comments!