Referee Comment No.2:

General comments

The study raises the problem of the influence of tropical and sub-tropical cyclones on the primary production of the ocean. This type of work was mainly based on satellite data. The innovative aspect of the manuscript is the use of data from the biogeochemical Argo float (BGC Argo), in addition to satellite data. This method allowed the authors to draw new conclusions, most of them contrary to the previous works. Data from the upper 1000 m water column collected by the BGC Argo with a frequency of one day (measurements were made every night) allow observations of temporal evolution (and spatial changes) occurring near the sub-tropical typhoon Trami passage. Thanks to these data, the authors can conclude that the observed enhancement of chlorophyll concentration in the surface layer is not the result of increased primary production (as previously thought only on the basis of satellite observations), but due to the displacement from deep layer of chlorophyll maxima to the surface. It is a well-written research paper with clearly defined assumptions and interesting, original, novel results. Construction of the manuscript is logical, paper is concise.

Dear Reviewer,

Thank you so much for evaluating our manuscript. We are glad the study can add new perspectives to typhoon induced ecosystem dynamics. The pointed weaknesses by the reviewer are important in improving the manuscript. We have modified the draft accordingly and hope the revised manuscript can fully meet your expectations. Please let us know if you have further comments.

The main weakness of the manuscript is the lack of reference to the Argo float position and trajectory. Autos say that 'Typhoon Trami passed over the BGC-Argo float'. Figure 1 clearly shows that the centre of the typhoon was approximately 60-100 nautical miles from the float position. Also, the wind speed (Fig. 3a) shows that the float was not in the centre of the typhoon. This may not be relevant to the performed analysis, but should be explained in more detail than is done on line 209. The potential impact on the results of the spatial variability of the ocean properties should also be explained. The Argo float does not stay in place, it drifts. Significant changes in SST and chlorophyll content are also visible before the typhoon passes near the float (Fig. 2).

Response: Thank you for the suggestion. Indeed, the typhoon center passed the study area approximately 100 km to the left of the BGC-Argo. Because of the intensive wind pattern during its passage, the typhoon-induced responses are dominant and can impact the surrounding area up to a few hundred kilometers away (Wang, 2020). As the reviewer mentioned, the distance between the typhoon and BGC-Argo is less influential for conducting the analysis.

Additionally, because of the movement of BGC-Argo, it undergoes different environmental conditions that are illustrated in Figure R1. Specifically, the BGC-Argo was located at 133.1°E, 30°N on Sep. 25, 133°E, 30.7°N on Sep. 30, and 133.3°E, 31.1°N on Oct. 3; thus, the zonal movement is not prominent, while the meridional shift is approximately 120 km northward. The labeled position in Figure 1 represents the location of BGC-Argo when typhoon passing over on September 30. The climatological mixed layer depth (MLD) for both the north and the south location along its trajectory can be obtained from the World Ocean Atlas (WOA; Locarnini et al., 2018) following Kara et al. (2000). The MLD to the north is 30 m, 46 m and 66 m on August, September and October, respectively, while that to the south is 28 m, 41 m and 60 m, correspondingly. Thus, the MLD along the trajectory of BGC-Argo is increasing, though the change is not prominent, during the study period, and it can result in the elevated subsurface Chl. This is why we think the change in subsurface Chl is related to the seasonal evolution of MLD and enhanced wind stress. Corresponding information has been added in the discussion in the revised manuscript (L. 149-154).

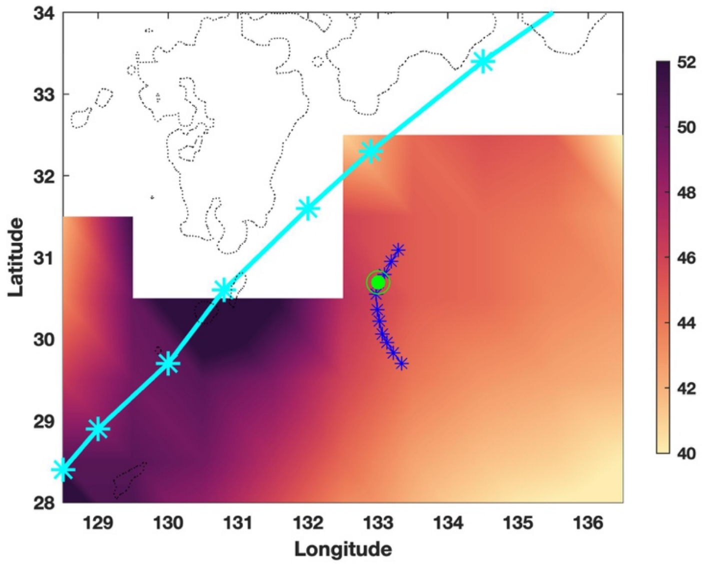

Figure R1. The averaged mixed layer depth (meter) in September and October overlaid with the trajectories of typhoon (cyan color, from Sep. 20 to Oct. 1) and BGC-Argo float (blue color, from Sep. 23 to Oct. 3). The location of float on Sep. 30, corresponding to the location shown in Figure 1, is labeled as a green dot.

Another weak point of the article are the repetitions, which the authors unfortunately did not avoid.

Response: Thank you very much. Following your suggestion, the manuscript has been checked throughout and repetitions have been removed. Additionally, we have improved the discussion and conclusion for a more precise presentation.

Despite these weaknesses I consider that the manuscript is a valuable contribution to understanding the influence of cyclones (typhoons) on the ocean in general, and on primary production in particular. At the same time, the article shows the importance and usefulness of the Argo program. The use of BGC floats profiling with frequency higher than the commonly used 10 days gives additional possibilities to conduct research on short-term phenomena.

Thank you very much for the positive evaluations. Though there are some weaknesses that can hardly been overcome because of the limited observations, our study offers a unique opportunity to improve the understanding of typhoon-induced dynamics. In addition, the sampling frequency is critical for a more comprehensive characterization of intensive and rapid processes.

Specific comments

Lines 117-119 repeated information from lines 88-89 Lines 121-122 (float) 'was sampling daily from 1000 m depth to the surface at 10m intervals' Comment: what are the float measurements vertical resolution? In lines 90-91 you write 'Measurements were made every night (around 22:00 local time) to avoid in-vivo fluorescence non- photochemical quenching, with ~ 1 m vertical resolution'.

Response: Thank you for pointing out the inconsistency. The vertical sampling frequency is indeed 1 m, which can be observed from the detailed vertical structure (e.g., the MLD in Figure 2). We have corrected the mistake (L. 105-106).

Line 124: 'The BGC-Argo float profiles' Comment: There are 'sections' or 'section charts' at Fig 2a and 2b, not 'profiles' (see comment to Fig. 2 in technical corrections).

Response: Thanks. The word has been modified accordingly.

Line 133: 'at 0.18 and 0.15 mg Chl a/m^3, respectively. These increases represent changes of 0.13 and 0.08 mg Chl a/m^3, respectively, above the concentration measured on September 29 before the typhoon approached to the area.' Comment: Some mis- calculation. 0.18-0.15=0.03; 013-0.08=0.05. What was the concentration in September 29?

Response: Thank you for noticing this issue. Different dates before the arrival of a typhoon can be used as a reference. For example, the value on September 23, a week prior to the typhoon, was 0.05 mg/m^3, while the value one day before the typhoon on September 29 was 0.07 mg/m^3. Thus, the change in chlorophyll on September 30 and October 3 compared with that on September 23 was 0.13 mg/m^3 and 0.1 mg/m^3, respectively. In addition, the change in chlorophyll compared with that on September 29 was 0.11 mg/m^3 and 0.08 mg/m^3, respectively. We apologize for mixing up the differences, and we have updated the numbers using September 29 as the reference to make them consistent throughout the text (L. 163-166).

Line 148: 'The calculated profiles of temperature' Comment: same as in line 124.

Response: Done. Thanks.

Line 208, Figure 1. I am not sure if the method of representing the effects of a typhoon transition (Figure 1) is optimal. The averages for the 20-day period (September 10- September 30 and October 1- October 20) should strongly underestimate the effects of typhoon activity. Therefore, such significant temperature anomalies for September 28 and 29 are surprising. At the same time, no visible effects for dates before September 23.

Response: This is a great question. Typhoon-induced ocean surface responses vary depending on typhoon features and the ocean status beneath. Composite methods are usually applied to obtain a general pattern for typhoon-induced ocean changes (e.g., Lin et al., 2017; Wang, 2020). For typhoon Trami, the wind speed is weak during the first half of its lifespan, e.g., before Sep. 25; thus, the typhoon-driven changes in the ocean are small. Between Sep. 25 and Sep. 29, the typhoon is moving very slowly and inducing prominent sea surface cooling and chlorophyll enhancement, which is captured in Figure 1. After Sep. 29, the typhoon is still strong but fast-moving, and the situation is favorable to induce upper ocean responses, though the change is smaller compared with that before Sep. 29. It will be ideal to have observations along the track where the largest changes are being identified, but BGC-Argo data are still very sparse, and the only dataset available is enclosed in current study. Fortunately, the typhoon-induced changes are very clear and can be useful to help understand the dynamics.

Lines 208-210. What is the distance of the float to the typhoon centre?

Response: Thank you for asking. The typhoon is passing over BGC-Argo from the left side at a smallest distance of approximately 100 km. The information is added (L. 148-149).

Lines 239-240: 'The results clearly show mixing is overwhelming the dynamics comparing with the upwelling' Comment: This is too general statement that should not be drawn from a single observation.

Response: Thank you for the comment. We agree with the reviewer that the observation from a single BGC-Argo cannot guarantee a general conclusion. The statement has been modified to tone down the comparison between mixing and upwelling, only focusing on current study (L. 287-288).

Technical corrections

I am not a native English speaker and I will not correct linguistic errors, yet in my opinion the article requires linguistic intervention. For example: lines 49-50 ‘Thus, strong typhoons, e.g., category 4 or 5, in mid-latitude regions are generally characterized as fast 50 moving and strong typhoons ‘. This sentence needs improvement (strong typhoons are strong typhoons). Figure 1. The float route should be showed (if the map scale allows). Figure 2. Title ‘Profiles of temperature (a) and chlorophyll’ is not correct. Figures 2a and 2b show not profiles but sections or section charts, while figures 2c and 2d show time series. The same remark applies to Figs 4a and 4b.

Response: Thank you for this suggestion. The language has been modified by a native English speaker for the entire manuscript. In addition, the inaccurate words are corrected. The movement of the float is mostly limited in a very small area (Figure R2); thus, its trajectory is not shown in the figures. Alternatively, the description for BGC-Argo locations is added in detail in the revised manuscript (L. 149-152).

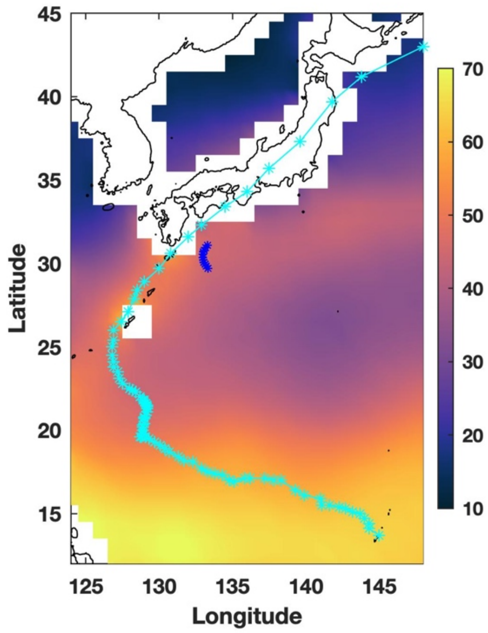

Figure R2. The averaged mixed layer depth (meter) in September and October overlaid with the trajectories of typhoon (cyan color, from Sep. 20 to Oct. 1) and BGC-Argo float (blue color, from Sep. 23 to Oct. 3).

Reference:

Kara, A. B., P. A. Rochford & H. E. Hurlburt. 2000. An optimal definition for ocean mixed layer depth. Journal Geophysical Research, 105(C7), 16803-16821.

Lin, S., W. Z. Zhang, S. P. Shang & H. S. Hong. 2017. Ocean response to typhoons in the western North Pacific: Composite results from Argo data. Deep-Sea Res. I, 123, 62-74.

Locarnini, R. A., A. V. Mishonov, O. K. Baranova, T. P. Boyer, M. M. Zweng, H. E. Garcia et al. 2018. World Ocean Atlas 2018, Vol. 1: Temperature. A. Mishonov Technical Ed.; NOAA Atlas NESDIS 81, 52 pp.

Wang, Y. 2020. Composite of typhoon induced sea surface temperature and chlorophyll-a responses in the South China Sea, Journal Geophysical Research: Oceans, 125, e2020JC016243.