Comments on the manuscript "A Limited Effect of Sub-Tropical Typhoons on Phytoplankton Dynamics" by Chai, F., Wang, Y., Xing, X., Yan, Y., Xue, H., Wells, M., and Boss, E..

General comment:

The manuscript "A Limited Effect of Sub-Tropical Typhoons on Phytoplankton Dynamics" by Fei Chai et al. describes the upper-ocean response, in terms of specific physical and biogeochemical features (temperature, mixed layer depth, chlorophyll, deep chlorophyll maximum), to the passage of Typhoon Trami (TT) offshore southern Japan coasts (Northwest Pacific Ocean). The issue has been already investigated in literature, recently showing that the overall role played by tropical cyclones on global primary production is quite limited (e.g. see Menkes et al., 2016, using ocean simulations). The novelty here is the use of high-frequency sampling vertical profiles of temperature and chlorophyll made available by a BGC-Argo float located near the Typhoon wake. BGC-Argo data significantly extend the amount of observations in comparison to what usually extracted from satellite, able to measure the surface in cloud-free conditions only. Conclusions show that mixing plays a larger role than upwelling, and TT weakly impacted on net primary production.

The manuscript is short and clear, with few but significant figures, very well explained and commented. However, I would point out some suggestions that may improve this study:

1. I think the paper would greatly increase its impact with some more deep investigation on the vertical mixing *vs* upwelling mechanism and the associated nutrient vertical flux, further supporting the thesis that no penetration through nutricline has effectively occurred. For example, would it be possible to include in the study some nutrient data (e.g. from a model, if not available from other sources) in order to fully demonstrate the typhoon impact as explained by the analysis of the BGC-Argo float measurements? As an example, data from EU Copernicus Marine Service could support the analysis of the physical driver (Global Analysis & Forecast Physics[1] at 1/12 degree), though not the same can be said for the biogeochemical parameters since the resolution at ¼ degree is possibly too coarse. I wonder whether Japan or China Ocean Forecasting operational centres may provide such model-derived data, or they can be available from other platforms. Another, probably more feasible, possibility would be to use a 1D-model approach, as the one developed by Terzic et al. (2019; https://doi.org/10.5194/bg-16-2527-2019) coupled with BFM biogeochemical model. In this direction, the study would surely benefit a lot from a model experiment which could reproduce the phenomenon and give the opportunity to deeply investigate the coupled physical-biogeochemical processes involved.

2. The paper focus is on typhoons, however, from the point of view of a reader, it would be interesting to know whether the results may be extended to all intense tropical cyclones (on the global scale) and which differences may be expected (also referring to literature) with extra-tropical cyclones.

3. Some typos and language editing is needed. Since I am not English mother-tongue I have only highlighted some points, but my feeling is that the paper readability would greatly benefit after a language editing.

[1]https://resources.marine.copernicus.eu/?option=com_csw&view=details&product_id=GLOBAL_ANALYSIS_FORECAST_PHY_001_024

Specific comments:

1. L30: “an increase in the number of intense typhoons in the region” … how is quantified the intensity of typhoons? Readers of Biogeosciences may not be totally aware of typhoon intensity scale, so maybe a short comment can be added here. Further, the intensity classification has also been object of wide discussions (e.g. see Lei et al., 2017, https://www.sciencedirect.com/science/article/pii/S2225603218301589), so a clarification may be worth.

2. L38: “resulting in a negative response proposed to **facilitate** continued global temperature increase” … do you mean “support , sustain”? …not totally clear, please explain and rephrase.

3. L49: “e.g., category 4 or 5” … this may be clearer when specific comment n. 1 has been fulfilled.

4. L59-L68: the mechanism is clearly explained, though concisely. I think an illustrative sketch with mid-latitude / extra-tropical vs tropical regions would further help the reader to understand it.

5. L74: “It was suggested that the delayed response of surface chlorophyll is related to the growth time needed for phytoplankton to exploit the increased nutrient concentrations” … it would be interesting to explicitly add (or at least give a reference for) a time scale for the growth time.

6. L94: “Float data passed through a computer-based real-time quality control (RTQC)” some basic details about the RTQC would be helpful.

7. L100: “MODIS L3 daily data” please provide more info for this data here, not just in the Acknowledgements.

8. L106: “On September 30, a sublayer formed above the mixed layer.” … where this information is extracted from? Fig.2 seems the right candidate, so you should refer to that one here.

9. L115-119: this information can be included in the “Methods” Section.

10. L133-136: a slight increase in surface Chla can be observed between 25 and 28 September, corresponding to weakening of the DCM chlorophyll intensity: can you comment on that? Moreover, the “reference baseline” of the surface Chla should be the one measured until 24 September, with almost constant values around 0.05 mg/m^3. Finally: any idea on the discrepancy between satellite and BGC-Argo following the second peak, later than 4 October?

11. L230: “The BGC-Argo floats typically provide three-dimensional observations at a 10-day profiling cycle to extend their operational lifetimes (Johnson and Claustre, 2016), a sampling frequency too low to capture synoptic weather and other short-term events.” … Totally right, however BGC-Argo floats may also have shorter profiling cycles, e.g. 5-day (see Bittig et al., 2019; https://www.frontiersin.org/articles/10.3389/fmars.2019.00502/full).

Technical / other corrections:

1. L28: “the heat content in the upper ocean (with the sea surface temperature (SST) as the indicator)”… possibly: “the heat content in the upper ocean (**quantified by** sea surface temperature (SST) as an indicator)” or something similar.

2. L43: “The feedback from ocean to typhoon is important for the development and maintenance of typhoons, as **the** requires extracting energy from ocean surface” … maybe “it”?

3. L67: “thereby **transfer** new nutrients into the photic zone” … maybe “transfering”?

4. L70: “Besides the intensive wind field, typhoons are also **associating** with intensified rainfall and cloud” … maybe “associated”?

5. L71: “Satellite-based studies occasionally capture the ocean surface **feature** during the passage of typhoon and offer **more dataset** at the wake following typhoons” … maybe “features” and “more data” or “a richer dataset”, or something similar?

6. L83: a short sentence closing the Introduction which states the object of the present work would be nice.

7. L95: “Data used in this study **are available at from** the Coriolis GDAC FTP server” … maybe “have been made available from” or simply “are available from”?

8. L108: MLT and MLC acronyms – though clear – have not been properly defined. You could simply say “We define MLT and MLC as …”

9. L127: “Figure 2a, **b**” … according to Fig.2, this should be Fig. 2a, c.

10. L132: “Figure 2b, **c**” … according to Fig.2, this should be Fig. 2b, d.

11. L193: “This is at least attribute to the solar radiation is much weaker comparing with tropics where the SST and stratification rebound quickly after passage of a typhoon” … this sentence should be corrected: “This is at least **attributed** to the solar radiation **which** is much weaker comparing with tropics where the SST and stratification rebound quickly after passage of a typhoon”.

12. L208: two “indeed” in the same sentence, please correct.

13. L213: “The decreasing in SST is a general pattern”, what do you refer to “general”? Do you maybe mean “well-known”?

14. L218: “The BGC-Argo measures vertical profiles that can be helpful to determine whether a net increasing in primary production, e.g., nutrient injection to upper ocean or subsurface bloom (Ye et al., 2013), taking place.” … this sentence should be corrected: “The BGC-Argo ~~**measures**~~ vertical profiles ~~**that**~~ can be helpful to determine whether a net increasing in primary production, e.g., nutrient injection to upper ocean or subsurface bloom (Ye et al., 2013), **takes** place.”

15. L241: “redistribution of DCM over the mixed layer;” … I would say “redistribution of the DCM-localized chlorophyll content over the mixed layer” or something similar.

16. L242: “the delayed bloom that induced by typhoons may be due to the cloud coverage during the passage of typhoon. Thus, it implies an underestimation for the typhoon induced mixing and its associated vertical redistribution of water masses, while the impact of nutrients that being injected into euphotic zone can be overestimated.” … this sentence should be corrected: “the delayed bloom ~~that~~ induced by typhoons may be due to the cloud coverage during the passage of typhoon. Thus, it implies an underestimation for the typhoon induced mixing and its associated vertical redistribution of water masses, while the impact of nutrients ~~that~~ being injected into euphotic zone can be overestimated.”

17. L421: caption of Fig. 5 … blue dashed lines should correspond to vertical profiles before typhoon, red solid lines should correspond to vertical profiles at the typhoon passage on 30 September; blue/red dashed arrows mean decrement/increment (of T and Chla, values lacking in the 100m - layer) … please confirm and add to the caption.

References

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