We thank reviewer #2 for raising important points regarding satellite data processing and the use of pigment ratio as indicator of phytoplankton community composition. All comments have been addressed or answered as described below. Reviewer's comments are copied below and have been italicized, our responses are indented and in normal black font, citation from the manuscript are in blue font, ~~strikethrough~~ text was deleted, and new sentences that were added in the revised version, in response to reviewer comments, are shown in green font text.

The manuscript investigated the physiological responses of phytoplankton assemblages by inland mass effects (IME) utilizing both satellite and in situ data. The paper presented a comprehensive and valuable dataset collected during the Tara Pacific expedition and evaluated the impact of IME on physiological responses primarily through satellite analysis. This paper offers valuable insights into IME, contributing to a better understanding of the coastal marine ecosystem. However, I have the following concerns that the authors should address:

Major comment No.1

It seems to me that this study did not sufficiently evaluate changes in phytoplankton community composition. While pigment ratios are indeed investigated through HPLC analysis, such as the ratio of photo-protective carotenoid concentrations or photosynthetic carotenoid concentrations relative to chlorophyll a concentrations, this analysis does not constitute a comprehensive evaluation of phytoplankton community composition. These ratios fluctuate in response to light, nutrient, and iron availability, even in the absence of significant changes in the phytoplankton community itself. Consequently, the sentences representing phytoplankton community composition in the Abstract of Line 5 and the Section 3.3 Characteristics of phytoplankton communities from bio-optical signals are not sound in their current form.

We agree with the reviewer that optical measurements do not provide a comprehensive assessment of phytoplankton community composition. While pigment ratios provide limited information on phytoplankton community composition and are subject to biases, there is a big body of literature using HPLC pigments for this purpose (e.g. Kramer et al., 2024). We adjusted the wording throughout the manuscript to clarify that the community composition was only investigated through pigment ratio analysis. Changes in phytoplankton composition were not the central objective of this paper, which focus on physiological stress indicators, and was only used in this study to complement the interpretation of the detected nutrient dynamics.

To clarify that we are investigating pigments ratios and not directly community composition we added the following sentence in section 2.2:

"Phycoerythrin concentrations were not measured as part of the HPLC analysis, thus we estimated the relative concentrations of phycoerythrin using the ratio of the Gaussian absorption function centered on the phycoerythrin absorption peak (i.e. 550 nm; Chase et al., 2013) to the Gaussian absorption function centered on 676 nm, the [Chla] absorption peaks (i.e. agauss550/agauss676). Although not a central objective of this study, we tracked variations in ratios of these accessory pigments to [Chla] (e.g. [PSC]/[Chla]; Table 2) as a crude indicator of changes in phytoplankton community composition. To quantify changes in the mean size of suspended particles, we computed the slope exponent …"

Furthermore, we added a sentence at the end of section 3.3 stating; "While pigment ratios provide limited information on phytoplankton community composition and are subject to biases, this analysis points to possible changes in community composition in association with the IME, a hypothesis that will need to be confirmed with more direct methods (e.g., imaging and metabarcoding), but beyond the scope of this study."

Finally, we revised the relevant sentence in the abstract as follows:

We also show that IME is often associated with changes in pigment ratios, which is suggestive of ~~indicates~~ changes in phytoplankton community composition.

Major comment No.2

The rationale behind utilizing POLYMER for atmospheric correction in this study remains unclear. In recent years, other studies have demonstrated that OC-SMART (Fan et al., 2012) offers superior atmospheric correction in optically complex coastal waters. Therefore, it would be a good idea to explain the specific reasons that led to the selection of POLYMER as the atmospheric correction method.

We chose to keep the technical details regarding the satellite data processing method to a minimum because we followed the same strategy as for [Chla] in the first part of this study (Bourdin et al. 2025), and because this study is already quite detailed and long. The rationale behind utilizing POLYMER is explained in Bourdin et al. (2025). In short, the IME detection algorithm used in this study—and developed in Bourdin et al. (2025)—relies on gap-less maps of [Chla] to function properly. The objective is to reduce the binning time to a minimum while still recovering smooth and gap-less binned products. Therefore, we needed to maximize data recovery to ensure enough realizations for each pixel over the binned period for the median to produce smooth maps.

We used the atmospheric correction POLYMER because it has been reported to retrieve high-quality data in areas impacted by sun glint and the adjacency effect (i.e., nearshore and around clouds), which can greatly impact tropical and subtropical regions. The choice of POLYMER versus l2gen to retrieve [Chla] maps was evaluated against *in situ* HPLC data and described in Bourdin et al. (2025); therefore, it was also applied in this study for consistency. OC-SMART would probably have been a good alternative, especially for its advantages in optically complex waters. Nevertheless, optically complex waters are not very common in the studied regions. The turbidity and CDOM concentrations are generally low compared to coastal ecosystems of continents or higher-latitude regions. Moreover, pixels with bathymetry shallower than 30 m (plus one extra 1 km pixel) were discarded in this analysis to avoid the potential impact of bottom reflectance on the retrieved parameters. This further limit the potential occurrence of optically complex waters and reduces the benefit of using OC-SMART over POLYMER in this study.

The focus of this Part 2 study is to demonstrate the potential of satellite data for understanding the physiological stress of phytoplankton relative to macronutrient and iron limitations, in order to improve our understanding of the different enrichment processes involved in IME formation. Therefore, we did not further test any atmospheric corrections other than those tested in Part 1 (POLYMER and l2gen) and kept the method consistent between Parts 1 and 2 of the study.

Major comment No.3

In this study, ocean color sensors from MODIS/Aqua, MODIS/Terra, VIIRS/Suomi-NPP, VIIRS/JSPP, and OLCI/Sentinel3A&B were utilized. However, each sensor possesses a distinct resolution. MODIS, VIIRS, and OLCI have resolutions of 1 km, 750 m, and 300 m, respectively.

As explained in Bourdin et al. (2025), we adopted the spatial resolution of the satellite with the coarsest resolution among those merged: MODIS, at 1 km. We downloaded Level 1 data for OLCI, VIIRS, and MODIS at this 1 km resolution and produced corresponding Level 2 (L2) products.

A mention of the spatial resolution for these derived Level 2 products has been added to Section 2.3.

"We applied a polynomial-based atmospheric correction (POLYMER version v4.17beta2; Steinmetz et al., 2011; Steinmetz, last access: 2023-12-22) on both datasets to compute 1-km spatial resolution L2 remote sensing reflectance data (Rrs) using ancillary data from the European Centre for Medium-Range Weather Forecasts reanalysis model version 5 (i.e. ERA5)."

For the match-up analysis, it is unclear which relation was evaluated. Were the 1 km resolution data after merging evaluated? If so, the process of merging satellite data to achieve a 1 km resolution is not explicitly detailed in the provided information.

The matchups were performed between in situ underway data and level-2 satellite data of each satellite processed.

We added "Level-2" at the beginning of the section 2.5:

"Level-2 satellite estimates of SST, [Chla], and iPAR (different from the daily PAR used in η' computation) were individually calibrated against in situ measurements obtained from the underway system of the ship to minimize inter-sensor variability and biases."

We added a statement in Appendix A2 to clarify this point:

“Match-ups between the calibrated in situ data collected from the underway system and level-2 satellite data of each satellite processed were performed following recommendations from Bailey and Werdell, 2006.”

The Level-2 1 km spatial resolution products are evaluated and calibrated against *in situ* data; however, the merged products themselves are not evaluated. Section 2.5 details the adjustment procedure for each Level-2 satellite product and the 8-day median calculation used to generate the binned/merged products.

We have kept the technical details regarding the merging method to a minimum, as the methodology is already described in detail in Part 1 of this study (Bourdin et al. 2025). This approach was chosen to maintain focus, as the subsequent analysis is highly technical and the study is already quite extensive. More detailed explanations of the merging method and the rationale behind these choices are available in Bourdin et al. (2025).

Additionally, only OLCI and VIIRS were employed for bbp analysis. Given the high-resolution requirements in coastal regions, only OLCI, which is equipped with fluorescence sensors, was deemed suitable for this purpose.

The 1-km spatial resolution products we computed offered a reasonable compromise of spatial resolution and quantity of data to process to retrieve to 6-month long detections of IME in the 4 studied regions.

Our method already significantly improved the detection compared to the previous studies that relied on 4-km spatial resolution products and yearly averages. Moreover, our analysis relies on having the same spatial resolution between all studied parameters, therefore, we used the spatial resolution of the satellite with the coarsest spatial resolution of all the merged satellites, 1-km.

To enhance the clarity of the study, it would be beneficial to include a diagram of chlorophyll in the Appendix's Figure A3 because the accuracy of chlorophyll propagates to subsequent parameter estimation. Additionally, it is recommended to cite Brewin et al. (2015) for statistical analysis.

We added a panel (c) to Figure A3 showing the regressions of [Chla] estimated from the different satellite data versus calibrated [Chla] estimated from the underway system. We adjusted the caption and reference in the text and added “The statistics of these match-up relations were subsequently used to select the atmospheric correction and [Chla] algorithm performing best in our case (Brewin et al., 2015) and the normalized root mean square errors (*nRMSE*) were used as uncertainty estimates and were propagated to subsequent products (see comparison in Appendix B in Bourdin et al., 2025, and uncertainty propagation in Appendix A4 of this study).” to Appendix A2 which includes the citation suggested.

At last, we want to thank the reviewer again for the important points raised and hope that both the reviewer and editor agree that the above revisions and response address these points and improved the clarity of the paper.

References:

Bourdin, G., Karp-Boss, L., Lombard, F., Gorsky, G., and Boss, E.: Dynamics of the Island Mass Effect – Part 1: Detecting the Extent, Biogeosciences, 22, 3207–3233, https://doi.org/10.5194/bg-22-3207-2025, 2025.

Kramer, S. J. and Siegel, D. A.: How Can Phytoplankton Pigments Be Best Used to Characterize Surface Ocean Phytoplankton Groups for Ocean Color Remote Sensing Algorithms?, Journal of Geophysical Research: Oceans, 124, 7557–7574, https://doi.org/10.1029/2019JC015604, 2019.

End of review