Response to reviewers

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We thank both reviewers for their detailed comments for improving the manuscript. Below is a response letter for the reviewers' comments. The green texts show our responses to the comments. The blue texts show our proposed changes in the revised manuscript. Line numbers referred in this response letter are based on the submitted manuscript instead of the revised manuscript.

Editor's comments

Answer: Thank you for the comments. We added citations and data archive information of Argo and NAAMES datasets in both the main text and data availability section. We also updated the zenodo code and reference for plotting, validation and diagnostics.

1. In addition, the color of the right y-axis is inconsistent across the panels in Figure 4. Please revise the figure to ensure visual consistency, or clarify the reason for the differing color schemes in the figure caption.

   Answer: The figure is updated now.

2. Also, the referee provided a few additional suggestions in the attached file. Please consider revising the manuscript accordingly.

   Answer: Please see below for the revision.

Reviewer's comments

Dear authors, You addressed all my concerned and I find the revised manuscript of value to the community. I am returning a few comments on the PDF you may consider to address, as they pertain to some point you made in your answers you may consider elaborating about. All the best, Emmanuel Boss

Answer: Thank you for the useful comments.

1. L62: FYI The close matching between the relationship in Behrenfeld et al., 2005 (based purely on heuristics and remote sensing) and that of Graff et al (purely empirical) do provide validation. In addition, the validation of nutrient stress based on light and chl/C_phyto ratio (Bourdin et al., 2025, https://www.science.org/doi/10.1126/sciadv.aed8089) provides an independent consistency check.

   Answer: Thank you. We added relevant information in the sentence.

   In particular, satellite ocean colour can be used to derive phytoplankton carbon (Behrenfeld et al., 2005; Graff et al., 2015; Bellacicco et al., 2020) using an empirical relationship between the backscattering of particles and phytoplankton carbon supported by both direct (Graff et al., 2015) and indirect evidence based on the ratio between chlorophyll and carbon and nutrient stress based on light (Bourdin et al., 2025; Martiny et al., 2026).

2. L129: This is further complicated by mixotrophy...

   Answer: We added a sentence to clarify this point.

   As a simplification of the real ecosystem, these functional types do not capture the full diversity of plankton trophic strategies, e.g., mixotrophy, but they remain a useful approximation of the broader plankton ecosystem.

3. L171: they cannot resolve processes occurring under clouds (e.g. photoacclimation) in monthly composite which are based on only the times a satellite could 'see' the ocean..

   Answer: We added a sentence for this

   Because the monthly product is based purely on data without clouds, it cannot resolve short term processes (e.g. photoacclimation) under clouds over the course of the month.

4. L177: the QC measurements of chlorophyll of BGC-Argo do not correct for the fact that Fchl/Chl ratio has been found to change significantly around the world (e.g. Roesler et al., 2017). Thus, they can be significantly bias relative to satellite [chl]. Some of us add a calibration based on biogeochemical region to correct for this likely offset.

Answer: We added:

Note that quality-controlled measurements may still contain biases because the fluorescence-to-chlorophyll ratio varies spatially, and this variability is not captured by the applied corrections (Roesler et al., 2017).

References

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