

Replies to reviewer(s) comments

Dear Editor and Reviewers,

This is the response of the comments on the manuscript “Chlorophyll-a Variation Trends in Marginal Seas: Assessing the Impact of Global Heating and Anthropogenic Activities Using Time Series Satellite Data (1998-2020)” (with ID MARGO-D-23-00381). Thank you for handling our manuscript and for giving us the opportunity to revise it.

We sincerely appreciate the reviewers' thorough and constructive comments. We have carefully addressed all comments, with particular attention to improving the flow, language quality, mechanistic interpretation, and figure presentation. The entire manuscript has also undergone professional English-language editing in accordance with the journal's proofreading and submission guidelines. Detailed point-by-point responses are provided below.

Sincerely yours,

Xiaoyu ZHANG and co-authors

Reponses to Reviewer's Reports to Questions

Report #1

The authors have done a great job addressing the comments and improving the manuscript. The structure has been improved and the text enriched with further information and references where needed. I have only a few mostly technical points left.

I want to thank the authors for the efforts in making the code repository more comprehensible. I had suggested to translate the comments to English which the authors did. Further, the repository increased greatly in clarity because the authors expanded the readme/repository description.

232 use small letters in "The eastern coastal waters"?

Response: Thank you for noting this issue. We carefully checked the entire manuscript for similar inconsistencies and standardized the capitalization of geographical descriptions throughout.

259 your main characteristic of the enclosed sea does not really hold for the Gulf of Mexico? "The enclosed seas (here, the Bohai Sea and the Gulf of Mexico) are usually characterized by very slow water exchange,..." - contrasting your response to the review where you described the Gulf of Mexico as "enclosed seas with strong water exchange" (see also L. 558)

Response: Thank you for identifying this inconsistency. We have revised the relevant text, including the description around Line 558, to distinguish the Gulf of Mexico more precisely from a typical enclosed sea. The revised wording now clarifies that, although geographically semi-enclosed, the Gulf of Mexico has a stronger capacity for water exchange with the open ocean than more strongly enclosed systems such as the Bohai Sea.

371 surplus ;

Response: We identified this error and corrected it in the revised manuscript.

399 I would suggest move the brackets to the previous sentence: "availability of different satellite products (T1 period..."

Response: We have moved the parenthetical information to the preceding sentence, where it now serves as a direct clarification and improves readability.

402 " errors were eliminated"

Response: We have corrected the grammatical issue and revised the wording

516 unify use of articles in "distinct rises in SST for Amazon Estuary and Bohai Sea" to the rest of the manuscript

Response: We carefully checked and standardized the use of definite articles before geographical names throughout the manuscript.

1021-1023 rephrase

Response: We have rephrased these sentences to improve their clarity, flow, and grammatical accuracy.

1210 check sentence, did something get missing in the page break?

Response: We checked the original text and confirmed that no content was omitted at the page break. The complete sentence reads: "To isolate the impact of global warming from seasonal cycles, relationships between SST and Chl-a during periods of rising versus stable SST were compared across the five study regions (Fig. 9)." We have also refined the sentence to make the intended meaning clearer.

1283 remove brackets in "such as (e.g., Mississippi " or rephrase?

Response: We removed the unnecessary brackets and rephrased the sentence to improve its grammatical correctness and readability.

1732 below

Response: We have corrected this spelling error.

Fig. 1: I'm still unhappy with the geographic labels in this figure because of the small fontsize. Maybe consider to annotate only the most important features and omit the rest, so you could increase the fontsize?

Response: Following the reviewer's recommendation, we removed geographical labels that are not directly referenced in the descriptions or discussion of the study regions. We also increased the font size of the remaining labels and optimized their placement to improve the overall clarity and readability of the figure.

Tables: Personally, I'd prefer to have articles for the regions in the text ("the Bohai Sea"), whereas standalone region names in the tables ("Bohai Sea")

Response: We have revised the geographical names accordingly. Definite articles are now used consistently in the main text where grammatically appropriate, whereas standalone region names in tables are presented without articles.

Report #2

General Assessment

This study presents a valuable and timely comparative analysis of long-term chlorophyll-a (Chl-a) trends across five marginal seas with contrasting hydrodynamic connectivity and anthropogenic nutrient pressures. The central finding—that the suppressive effect of warming on phytoplankton biomass is systematically modulated by basin confinement and terrestrial nutrient retention—offers an important refinement to the prevailing "global warming reduces Chl-a" paradigm. The multi-sensor data fusion and the "warming versus stable SST window" comparison are methodologically robust. The manuscript is well within the scope of this journal and warrants publication. However, several issues—particularly regarding language quality, mechanistic interpretation, and figure clarity—should be addressed before final acceptance.

Major Revisions (Mandatory)

1. English language and copyediting

The scientific content is strong, but the English expression contains numerous errors that impede professional readability and must be corrected before publication. Specific examples include, but are not limited to:

Word concatenations: e.g., "distintreasingChlwithdistancffshore" (Page 13) — clearly an editing oversight.

Repetitive articles: e.g., "the the Bohai Sea" (Abstract).

Awkward phrasing: e.g., "the relationship with intensifying human activities ... needs to pay attention" (Page 24) — should be revised to "merits further attention" or "warrants concern".

Incorrect preposition usage: e.g., "correlations between Chl-a with SWS" should be "correlations between Chl-a and SWS".

Action required: We strongly recommend that the authors engage a native English speaker or a professional scientific editing service to thoroughly proofread the entire manuscript, with particular attention to the Abstract, Discussion (Section 4.2), and Conclusions.

Response: We followed the reviewer's recommendation and engaged a professional native-English scientific editing service to edit the entire manuscript. Particular attention was given to the Abstract, Section 4.2 of the Discussion, and the Conclusions. We also carefully checked the revised manuscript for typographical errors, missing spaces, incorrect articles and prepositions, awkward expressions, and other language-related inconsistencies.

2. Cautious framing of mechanistic inferences

The authors attribute the sustained Chl-a increase in the central Bohai Sea to "nutrient aggregation" facilitated by weak hydrodynamic exchange. While this is a plausible and well-reasoned inference based on spatial distribution patterns, the manuscript does not provide direct hydrodynamic tracer simulations or in-situ nutrient flux time-series data to confirm this retention mechanism. To maintain scientific rigor and preempt post-publication criticism, the authors should add a brief but explicit caveat statement in the Discussion (e.g., at the end of Section 4.2.2 or 4.2.3), acknowledging that this interpretation remains a reasonable inference rather than a demonstrated causal pathway, and suggesting that future work using physical-biogeochemical coupled models or isotopic tracers would be valuable for validation.

Response: Thank you for this important suggestion. We revised the relevant discussion to clarify that nutrient aggregation in the central Bohai Sea is a plausible interpretation supported by the observed spatial patterns rather than a directly demonstrated causal mechanism.

Minor Revisions (Recommended)

3. Figure clarity and accessibility

Figure 4f: The monthly Chl-a variation lines for the five regions use the same solid line style, making differentiation difficult, especially in grayscale printing or for color-blind readers. Please assign distinct line types (e.g., dashed, dotted, dash-dot) to

each region in addition to the existing color coding.

Response: We revised Figure 4f by incorporating different line styles and five distinct marker shapes in addition to the existing color coding. These modifications make the five regional curves easier to distinguish in grayscale and improve accessibility for readers with color-vision deficiencies.

Table 6 (PCA loadings) : The presentation is currently a plain numerical matrix. To improve information retrieval, please bold or highlight the highest loading factor within each Principal Component. This will help readers immediately identify the dominant environmental driver in each sea area.

Response: In Table 6, we have formatted the highest absolute loading for each principal component within each study region in bold and underlined font, allowing the dominant environmental factor to be identified more readily.

4. Strengthening the anthropogenic driver quantification

The current analysis uses basin population density and a qualitative "Human regulation" ranking (Table 1) as proxies for anthropogenic pressure. If accessible, we suggest the authors consider incorporating actual time-series estimates of riverine total nitrogen (TN) and total phosphorus (TP) fluxes (even for just the Bohai Sea and East China Sea, where data are relatively available) into a supplementary regression analysis. This would allow a more quantitative separation of the relative contributions of warming versus nutrient-loading changes to the observed Chl-a trends. If such data are unavailable, a sentence noting this as a data limitation would be appropriate.

Respond: Thank you for this constructive recommendation. We added a statement in the Data and Methods section acknowledging the limitation that actual time-series estimates of riverine total nitrogen (TN) and total phosphorus (TP) fluxes were unavailable.

5. Correction of typographical artifacts

Please remove the repetitive numerical line entries (e.g., the repeated "390 390..." sequences on Page 21) that appear to be PDF conversion artifacts, and ensure the final submission is a clean typescript.

Response: We removed the anomalous repeated numerical entries and other artifacts introduced during document conversion. We also carefully checked the revised manuscript to ensure that the submitted version is clean and free of similar formatting errors.

Specific Technical Corrections

Abstract: "...correlates negatively with raising Chl-a." to "...correlates negatively with rising Chl-a." or "...with an increase in Chl-a."

Response: We corrected this expression and revised the sentence to read “ correlates negatively with an increase in Chl-a” for greater clarity.

P. 13, Section 3.1: "distintreasingChlwithdistancoffshore" Insert spaces: "distinct decreasing Chl with distance offshore" (and correct spelling).

Response: We identified this word-concatenation artifact and restored the missing spaces while correcting the spelling. The revised phrase now reads “ a distinct decrease in Chl-a with increasing distance offshore.”

P. 24, Section 4.2.3: "...the relationship with intensifying human activities ... needs to pay attention." Revise to: "...the relationship with intensifying human activities ... warrants closer attention."

Response: We revised this expression to “the relationship with intensifying human activities warrants closer attention,” thereby improving its grammatical accuracy and precision.

Table 6: All loadings presented in plain font. Bold the highest absolute loading per PC for each sea area.

Response: We have formatted the highest absolute loading for each principal component within each study region in bold and underlined font to distinguish it clearly from the other loadings.

Final Recommendation

The scientific approach, data quality, and conceptual novelty of this work are sufficient for publication in this journal. The required revisions are primarily editorial (language polishing) and minor interpretive clarifications. I have no reservations regarding the core methodology or conclusions. With the above revisions implemented, the manuscript will make a solid and impactful contribution to our understanding of coastal phytoplankton dynamics under the dual pressures of global warming and anthropogenic nutrient regulation.