

Dear Editor,

Thank you very much for your valuable suggestions and comments on our manuscript. We have carefully reviewed the feedback and have made the necessary corrections in line with your suggestions. The new revisions are highlighted in green, while the previous modifications remain highlighted in yellow for clarity.

We appreciate your time and consideration, and we hope that the changes meet your expectations. Please feel free to let us know if further revisions are required.

Sincerely,
Nicolas Schiffrine on behalf of all co-authors

Public justification (visible to the public if the article is accepted and published):

Dear authors,

Many thanks for having provided a revised version of your manuscript. I believe all comments from the two reviewers have been addressed and that your manuscript can be accepted for publication.

I just have few requests for minor changes that I would like you to consider.

1) L41: Please do not cite this reference, only a small paragraph on ocean acidification (the fact that the arctic is acidifying more than the rest of the ocean is known for a long time) and prefer citing the few (x3) references cited by Ardyna and Arrigo.

Response: We have revised the sentence accordingly and now refer to the Arctic Monitoring and Assessment Programme Assessment 2018: *Arctic Ocean Acidification*, which provides a more suitable reference for the rates of acidification in the Arctic (L41).

2) L211: Please rephrase this new sentence avoiding repetitions: “corresponding to the season with minimal sea ice cover and a better accessibility by ships to the Arctic” or something like this.

Response: We have reworded this sentence to avoid repetition (L211-212).

3) L218: Avoid using acronyms that are not used further in the manuscript (SCM). There are potentially more in the text, to check.

Response: We have removed the acronym "SCM" and checked the manuscript for any other unused acronyms

4) L258: Isn't it *Prochlorococcus marinus*?, and L263: *elongatus*? Perhaps you want to cite only the genera

Response: The sentences have been rephrased for clarity, and we now explicitly cite only the genus *Prochlorococcus* (L256-259).

5) L489, and your answer to RC1: you should discuss more in the text the rationale for using this method (also detail LOESS: LOcally Estimated Scatterplot Smoothing)

Response: We have expanded the discussion to explain the rationale for using the LOESS method, emphasizing its usefulness for capturing non-linear patterns in datasets spanning multiple decades.