

Reviewer comments in blue

Author comments in black

We thank the editor and both reviewers for all the feedback that was provided to strengthen and clarify the work in our manuscript. The additional minor and technical comments have been addressed and corrected. We look forward to publication in Biogeosciences. Line by line responses to the reviewers are detailed below.

Referee #1

This revision fully addresses my previous concerns about the statistical significance of the results. I find the conclusions of the paper much more convincing now. I have a couple of very minor additional suggestions or corrections. Line numbers are from the manuscript not the tracked changes version.

In most cases throughout the paper, the p value is just listed as $p < 0.05$. Where convenient (for example where just one test is being discussed), I suggest listing the actual p value. The amount below 0.05 is informative.

In a prior version of the draft we used more specific p-values, however we decided it was simpler for the reader to use a consistent threshold value of $p < 0.05$.

Line 193. Fig. 3 a-c should be Fig. 3 a, c, e.

Corrected

Line 195. Fig. 3 d-f should be Fig. 3 b, d, f.

Corrected

Line 233 and Figure 5. I really like the change to Fig. 5 in adding the individual years rather than showing the MHW composite. The text near Line 233 needs to be revised accordingly.

Corrected from “the 2 μM nitrate contour during marine heatwaves (thick dashed line)” to “the 2 μM nitrate contour during marine heatwaves (thin dashed lines)”

Line 298 – 8g should be 8e?

Corrected

Line 635 – stray character

Character deleted

Referee #2

This paper is mostly finished subject to some minor technical corrections. Most of the errors that I pointed out in the figure legends/captions have been corrected.

I am a bit concerned by this sentence in the Abstract: "Prior work showed that these events, including the 2014–2015 “warm blob,” are associated with widespread surface nutrient declines in the subpolar Alaska Gyre (AG) and the North Pacific Transition Zone (NPTZ), but reduced concentrations in the NPTZ only." Does this make sense? How can surface 'nutrient' decline but nutrient concentration does not? The implication is that the latter refers to concentration of something else. Maybe there is a word or a symbol missing after "reduced". It looks like there is some extra space; maybe a special character just failed to render in the PDF.

Corrected to read: “reduced chlorophyll concentrations in the NPTZ only”

2.2 Statistics

On 91-100 specify whether the overall "warming" trend removed was a linear trend (probably, but good to be clear).

“linear” added to description of warming trend

I still think it is necessary to discuss autocorrelation: clearly these authors do not think it is important and quite possibly they are correct. I would just add a single sentence: "As we used annual or seasonal mean data, we assume that autocorrelation is negligible and calculate significance based on the total number of years in the time series."

Sentence added as suggested

L135 Liebig 1840 is not an appropriate reference here. Liebig's Law refers to yield, not growth rate (see e.g., Droop 1983 Bot. Mar. 26: 99; Cullen 1991 L+O 36: 1578; Litchman 2007 in Falkowski and Knoll, eds, "Evolution of Primary Producers in the Sea"; <https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/liebigs-law-of-the-minimum>)

Reference changed to Droop 1983 and added to bibliography

Figures 1 + 4: the contour lines still look black to me (stated in caption to be gray).

Changed to black in Fig 1, but the contour is gray in Fig 4.

Figure 5: description of the black and red boxes is still incomplete.

Specified that AG is a red box.

Figure 6: "organic" misspelled

Corrected

Figures 8 + 9: There still seems to be a discrepancy between the legends ("Mod MHW composite" in one case and "MHW. MHW composite" in the other), and between the linestyle shown in the legend for individual years and that actually used in the plots.

The legend on figure 8 has been corrected to read "Mod. MHW composite" and the individual years line styles in the legends of Figures 8 & 9 have been corrected.