

Replies to reviewer 1:

We sincerely thank the reviewer for the helpful comments. We have addressed each point individually—please find our detailed replies below in blue.

Line 372-373: “observed elevated CHL is strongly linked to phytoplankton growth. . .” The authors did not actually measure growth, right? What we are talking about here is assumed growth? Please clarify.

‘Indeed, the observed elevated CHL—commonly associated with phytoplankton growth in the literature—primarily occurs only offshore, within the Zeu...’ (Line 372-373).

Throughout: Use scientific notation when necessary (CHL conc)

We have updated were was needed the CHL concentrations with scientific notation:

- CHL ($\sim 30 \times 10^{-3} \text{ mg/m}^3$)...(Line 348)
- CHL was $\sim 5 \times 10^{-3} \text{ mg/m}^3$ (Line 350)
- while CHL is around $4.6 \times 10^{-3} \text{ mg/m}^3$. (Line 401)
- waters below the 28.3 isopycnal indicate that the DO and CHL values reach $62 \text{ } \mu\text{mol/kg}$ and $2.9 \times 10^{-3} \text{ mg/m}^3$, respectively. Above the 28.2 isopycnals, the DO and CHL have values of $203 \text{ } \mu\text{mol/kg}$ and $79 \times 10^{-3} \text{ mg/m}^3$... (Line 402-404)

Lines 445 - 448: I am confused about the relationship between these sentences. Aren’t they talking about the same mechanism- the uplift of nutrient rich waters along the 28.3 isopycnal? Perhaps it is just the use of “further” that confuses me?

Dear reviewer we have rephrased as you suggested. We agree that the use of 'further' may have caused some confusion. The revised sentence now reads: When these nutrient-available waters reach the Zeu, they can stimulate phytoplankton blooms, enhancing primary production (Falkowski et al., 1998). The uplift of the 28.3 isopycnal ($\sim 60 \text{ m}$) due to the presence of the cyclonic eddy (Fig. 7), also influences nutrient availability...(Lines 445-448)

Lines 485 - 487: Should this read: “Unlike previous observations and interpretations of the NRS, [this study observed] a reversal of the currents in the eastern half of the basin prevented the inflow of warmer, fresher water from the south” ?

You are absolutely right, and we have rephrased this accordingly.

Unlike previous observations and interpretations of the NRS (e.g., Asfahani et al., 2020; Papadopoulos et al., 2015; Yao and Hoteit, 2018), this study observed a reversal of the currents in the eastern half of the basin prevented the inflow of warmer, fresher water from the south.(Lines 485-487)

Furthermore, we have updated the colorbars in several figures (Figures 5–8 and Figure 11) to comply with colorblind-friendly design. Specifically, we have adopted **cmocean** colormaps to ensure perceptual uniformity and accessibility. (Thyng, Kristen, et al. “True Colors of Oceanography: Guidelines for Effective and Accurate Colormap Selection.” *Oceanography*, vol. 29, no. 3, The Oceanography Society, Sept. 2016, pp. 9–13, doi:10.5670/oceanog.2016.66.)