1 General comments

This study combining satellite and in situ observations shows that coastal eddies can transport relatively high-biomass waters offshore into the highly oligotrophic Eastern Mediterranean Sea. The manuscript is clearly written, well structured and pleasant to read, with a rigorous and transparent methodology that makes the results easy to follow. The findings are significant, as the role of fine-scale physical processes in structuring biological dynamics in oligotrophic regions remains insufficiently documented, despite likely being a key mechanism for sustaining marine ecosystems in such environments.

In my point of view, this paper is almost ready to be published after few minor comments (see below). My only general suggestion is to expanding the discussion to better contextualize the role of fine-scale physical features in oligotrophic systems. Building on your results, and consistent with previous studies (see for example refs in the specific comment 10. and also Yang et al., 2023 and Prants, 2022 and refs within - see below for doi links), it would be valuable to discuss what these findings imply for understanding the functioning of the global ocean. In particular, although such eddies are episodic at a given location and time, in the ocean they are ubiquitous and recurrents. This raises the question of their cumulative impact on marine life in oligotrophic systems representing a major part of the ocean. A more explicit discussion (in complement of what you already mention in section 4.4 lines 346 to 350) of how your study contributes to the broader effort to understand the influence of these pervasive, fine-scale dynamics on marine ecosystems under oligotrophic conditions would strengthen the manuscript.

Prants (2022) https://doi.org/10.1016/j.pocean.2022.102790
Yang et al., (2023) https://doi.org/10.1038/s43247-023-01160-2

2 Specific comments

1. Line 36, “small-scale dynamic” :

   In recent literature, the term fine-scale is more commonly used to describe structures spanning timescales of days to weeks and spatial scales of 1–100 km (both submesoscale and mesoscale) (eg. Morrow et al., 2019 ; Mangolte et al., 2023 ; Lévy et al., 2024, Oms et al., 2024). If your intention is to specifically refer to submesoscale processes, it would be more precise to use the term submesoscale than small-scale. This is mainly a comment aimed at encouraging the use of consistent nomenclature in the community.

   Morrow et al., (2019) https://doi.org/10.17125/gov2018.ch08
   Mangolte et al., (2023) https://doi.org/10.5194/bg-20-3273-2023
   Lévy et al., (2024) https://doi.org/10.17125/gov2018.ch08
   Oms et al., (2024) https://doi.org/10.1016/j.jmarsys.2024.104021

2. Section 2.1.1 :

   I do not clearly understand the temporal coverage of the satellite data. What are the dates of the ocean color and SST dataset ? And why were altimetry data from 1993 to 2012 used, rather than a more recent period that would be consistent with the glider missions or cruises ?

3. Section 2.2.1 - lines 123-124 :

   Is the factor two for the threshold arbitrary or empirical ? How much this value could change the results ?

4. Section 2.2.1 - line 132 :

   Is C_{eddy} time-dependent ? Why “eddy-period profiles” either than just “eddy profiles” ?

5. Section 2.2.2 - line 158 :

   “This polygon was used to collocate HF-radar observations.” By doing that you consider no offset between the chlorophyll front and the physical front. Do you think that a potential

spatio-temporal offset between both fronts could modify your results ? (No need to change anything, it is just a curiosity question)

6. Fig. 1C :

   What is the date of ADT and geostrophic currents ? (see the specific comment 2.)

7. Section 3.3 - lines 221 to 230 :

   I do not understand to which figures you refer to when you talk about the integrated anomaly profiles

8. Fig. 5, 6, 7

   Why not using density instead depth for representing vertical profiles ?

9. Section 3.4

   Could you clarify how changes in vertical nutrient profiles are attributed to eddies passage rather than to local background variability ? It could be worth to including an estimate of variability (e.g. standard deviation at each depth, if replicates are available)

10. Section 4.2 - lines 321 to 323

    A local biological answer to fine-scale forcing could be qualitative (eg. change in communities composition) rather than quantitative (chlorophyll concentrations) particularly in oligotrophic regions. Maybe this could be mentioned in the conclusion. Here, few examples of studies that you could check for this point :

    Liu et al., (2025) https://doi.org/10.1038/s43247-025-02365-3

    Gray et al., (2025) https://doi.org/10.1038/s41467-025-56794-x

    Garcia et al., (2026) https://doi.org/10.5194/ascmo-12-21-2026

    Hernandez-Hernandez et al., (2020) https://doi.org/10.3389/fmars.2020.00667

    Hernandez-Hernandez et al., (2022) https://doi.org/10.3389/fmars.2021.592703

3 Technical corrections

1. Section 2.2.1 - lines 123-124 :

   The sentence “A threshold of ...” could be ended by ”to detect those eddies” or something similar

2. Section 2.2.2 - line 145 and line 149 :

   You could add the variable names (G_{thr}) and (C_{amp}) in the following sentences

   “A robust gradient threshold (G_{thr}) was ...”

   “an adaptive amplitude (C_{amp}) threshold was ...”

3. Fig. 1 :

   Adding names of features (cyprus eddy, rhodes gyre, levantine coast, nile river ...) on maps could help (especially if readers are not familiar with the med sea)

4. Section 3.1 - line 177

   A space is missing after “(Fig 1A),”

5. Fig. 5 :

   A space is missing after “[...] black).”

6. Section 3.4 - line 244

   “[...] when station N800 was located [...]” could be rephrased to clarify that the station is fixed. For example something like “when coastal mesoscale eddies propagating offshore crossed or were adjacents to the N800 station”

7. Section 4.2 - lines 293 to 294

   “Elevated surface and subsurface temperatures observed within the eddy further support this interpretation. Independent ship-based observations at the time-series station N800 further support these findings.” These two sentences could be combined to avoid the repetition of “further support”