Review for Tzortzis et al. (2021)

General comments:

The manuscript of Tzortzis et al. constitutes an interesting analysis on phytoplankton community dynamics in response to a frontal region in the Western Mediterranean Sea. Extensive *in situ* datasets are used to characterise the hydrodynamics of the region, and provide insights on the response of phytoplankton community structure to fine-scale ocean dynamics associated with the frontal region. Generally, the results are fairly well presented and are interpreted appropriately in the discussion and conclusions. One of my major issues is that the manuscript contains superfluous information/analysis at times. There are many figures and different types of analysis presented, but the authors do not summarise all of these findings in a succinct and logical manner in the discussion. In some cases, the text/analysis can be condensed and moved as supplementary material, removed, or expanded upon. Finally, although the grammar is generally OK, I would recommend it for a check by an English editing service if possible. I recommend the manuscript for major revisions prior to publication in Biogeosciences.

Specific comments:

Abstract

Line 7: Another word to replace "towed fish"? I presume you mean the SeaSoar?
Line 7: I think you can rephrase the sentence to: "Multi-parametric in situ sensors mounted on the vessel, a towed fish/SeaSoar instrument and an ocean glider"
Line 8: Remove "A" before "particular attention"
Line 14: "Phytoplankton community structure"?

Introduction

Line 17: rephrase to "oceanic ecosystems" and remove "the".
Line 18: The word "compartment". Perhaps it is possible to find another alternative here?
Line 19: Global *climate* change?
Line 19: Since several years? Satellites have been acquiring observations of ocean colour/phytoplankton biomass for at least 2/3 decades. I would rephrase here. Also, I think you can remove "of phytoplankton"
Line 22: I think the line following "the term fine scales" needs the addition of commas e.g., The term "fine scales" refers here to ocean dynamical processes that occur on horizontal scales of the order of 1–100 km, are characterized by a small Rossby number, and have a relatively short lifetime from days to weeks".
Line 25. "Fine scale" should be "fine scale features"?
Line 27. See previous comment
Line 31. "In respect to bulk production". I think this can be removed, as you begin a new sentence talking about diversity as opposed to primary production…
Line 32. I would replace "Indeed", with "however".
Line 32. "effect of the fine scales" – not grammatically correct. You mean "effect of fine

scale oceanic features"? Please check and fix this throughout the manuscript.
Line 34. I don't think "in situ samplings" is grammatically correct. Please check and modify if necessary.
Line 37. "associated to" should be "associated with"
Line 38. Comma needed after "surface ocean"

Materials and Methods

- If I am not mistaken, you selected the two sampling trajectories based on two regions of Chl-a concentration using the satellite-based SPASSO tool. Based on Figure 1, I can see a region of high Chl-a corresponding to the WE transect, but have trouble distinguishing the second region of unique surface Chl-a that justifies the position of the NS transect. Perhaps it is the colour scale/colour bar limits. Are the regions also selected based on SST and currents? In any case, I would rephrase or try and be more specific of why these two sampling transects were selected, and which areas you are referring to. I believe the colour scale can be improved to highlight this.

- I am not really familiar with FSLEs or Langrangian techniques. Thus, out of curiosity, is the FSLE a commonly used index for detecting fronts/fine scale features? Can you provide citations supporting this? Do maps of altimetry/SST also show the existence of the front between the two water masses?

- Line 142. "later" should be "latter"?

- Is Figure 2 absolutely necessary to include in your results? It relates mainly to your methodology and I suppose isn't overly important for the story you are trying to tell. I would consider moving this to supplementary material.

- I think it would be helpful to modify your figure 1 to show broader study region/familiar landmarks, so readers not familiar with the Mediterranean Sea can get more of an idea of the region you are working in.

Results

- It would help to try and highlight the specific zonal feature being discussed in Figure 3. I can see several features based on the FSLE map, corresponding to the latitude 38^{o} N $20^{'}$.

- Out of curiosity, do the other transects (not presented) show the same results?

- Line 218. I would help the reader and refer to your figures here (Figs. 5b and d). I suppose the triangles indicate the position of this?

- Line 225 onwards. This is your results section and thus I would avoid trying to discuss your observations using citations. Perhaps this information can be moved to the discussion.

- Lines 237-239. Again, this seems more like discussion material.
Furthermore, although it is nice that you have shown similar results in temperature and salinity using an independent glider dataset, is the addition of a figure necessary here? You can probably briefly mention that the glider dataset showed similar results. I only mention this as the manuscript text is relatively short, and yet you have 16 figures. I would think about condensing your analysis slightly and think about where figures may be more appropriate as supplementary material.

- Following my previous comment, Figures 7 and 8 are not described in much detail. For example, Lines 241 – 244 are fairly broad, considering you are talking about three separate transects, for each hippodrome in Figures 7 and 8. I would try and be more clear and descriptive with your results here. Indeed, the data show a clear, interesting separation between the two different water masses (although note that this is less apparent in your density plots…).

- Line 247. For your DO and Chl-a plots, please re-clarify what hippodrome you are referring to (the NS one).

- Lines 247 – 249. What does "richness of structures" mean? Please be more descriptive with your results, or otherwise, remove superfluous material.

- Line 251. Chla is higher where exactly? Please expand and provide detail to your analysis.

- Lines 251 – 254. What plots are you referring to here? Also avoid general explanations in your results, especially without providing evidence or context e.g. "probably associate with vertical dynamics of the front". Provide more details (in the discussion) or remove. Please go through the whole manuscript and avoid such general statements.

- Line 255 onwards. I am struggling to understand the connection you are trying to make between Chl-a/DO and your "peak T/peak B". In the methodology, it is not fully clear to me what the motivation was for measuring these parameters. Please clarify. Furthermore, you do not really discuss these parameters in your discussion. Please consider what information is directly relevant to your analysis and justify the inclusion of each of your figures with corresponding text.

Discussion/conclusions

- Line 361. I would avoid using informal text like "thanks to the flow cytometry measurements".

- Lines 349 -359. Why don't you mention the consequences of these dynamics in terms of upwelling/downwelling here? This is what is driving your phytoplankton variability after all?

- 379 -380. Please expand on this! How does all of your statistical analysis support your results? And why is there no reference to the figures highlighting this analysis?

- Lines 337 – 348. This is quite confusing as written.

- Lines 362 onwards. What about the other phytoplankton groups identified by flow cytometry? You simplify here that there is two main groups, and yet quite an in depth analysis is presented for the other groups in figures 12 -15.

- What contributes to the variability in phytoplankton community structure along the WE hippodrome? It is quite clear you have two distinct northern and southern water masses, but I wonder if there are other physical mechanisms that may be driving the variability you see longitudinally? What about the horizontal movement of water masses?

- Overall, the discussion needs to fully encapsulate the results that you present. As it stands currently, it appears at times to only take bits and pieces of your story and I feel much of your previous analysis is ignored.