Comments from Reviewer 1

The manuscript by Roza and coauthors presents an interesting assessment of the utility of plankton records to investigate climate forcings, through the lens of periodicities in dinoflagellate cyst production off Cape Blanc, Mauritania. The authors leverage an impressive, high resolution, 18-year sediment trap record recently published by Roza et al. (2024) from an ecologically-relevant site nested in one of the four major eastern boundary upwelling systems, and consider it closely together with environmental parameters driving the local ecosystem. While wavelet analyses of dinoflagellate cyst time series have been published before, it is quite novel to use them as primary evidence to infer connections between the first trophic levels of the planktonic web and the environmental factors that drive them.

I think the manuscript deserves publication, but only after addressing several points that I will detail below.

Scientifically speaking, the study is relevant and advances the state of knowledge of the field. On the form, the text is well written but needs fine-tuning (I've made several suggestions). The figures are clear and well designed, illustrating well the data and facilitating interpretations.

The authors' decision to divide the time series into 3 phases is rather subjective. Personally, I would have probably divided it in only two main phases (pre- and post-2011), but this would not change the interpretations, only the break-down of descriptions.

The lines in the following answers correspond to the lines in the annotated manuscript.

Answer: Thank you for your time and feedback. We performed wavelet cross-correlation to help inform our decision to divide the time series into three phases. Additionally, we included explanations regarding what the results of the cross-correlation indicated about those shifts (see lines 397 - 401).

Specific comments

Points that need to be addressed, in order of appearance in the text, with more important points highlighted:

Introduction

1. Line 83: If using exactly the same groups as those of Table 1, their naming should be consistent (e.g., upwelling+dust group vs Maximum upwelling+dust). Since you used the former again at line 194, maybe update the names in Table 1?

Answer: The group names have been changed as suggested to maintain consistency (Table 1).

2. [important] L. 94. Without trying to boost my own citations, consider mentioning published studies were wavelet analyses have successfully been used on dinoflagellate cyst time series to detect cyclicities in environmental signals and their evolution over time (see for instance Patterson et al. 2005: 10.1016/j.marmicro.2005.02.006; Yu and Berglund 2007: 10.1016/j.yqres.2006.12.004; Bringué et al. 2014: 10.1016/j.quascirev.2014.09.022; Bringué et al. 2019: https://doi.org/10.1016/j.pocean.2018.12.007).

   Answer: Thank you. This suggestion was implemented in the manuscript (lines 105-108).

3. L. 94: "All time series have been compared…": Ok if they really were compared, for instance with covariation analyses, but I think you rather mean "considered together".

   Answer: The wavelet cross correlation was implemented to compare total dinocyt export flux with the parameters as advised by the other reviewer (lines 108 -111).

Materials and methods

1. [important] L. 110: Please also comment on how the ITCZ position affects wind direction (since you use the variable in your wavelet analyses).

   Answer: This suggestion was implemented in the manuscript (lines 125 - 127).

2. [important] L. 117: Pure Natrium Chloride (NaCl2): Please check - seems like this molecule does not exist naturally, and Romero et al. (2020) state "pure NaCl".

   Answer: The molecule name was corrected to NaCl (line 135).

3. L. 134: Can you state the maximum time a sample was exposed to sonication? Price et al. (2016; http://dx.doi.org/10.1016/j.revpalbo.2015.12.009) recommend no more than 2 min, with sonication of 5 min observed to damage cysts and palynomorphs.

   Answer: The sonication was set to 100 seconds. This information has been added to the manuscript (line 152).

4. [important] L. 147: Update title of section 2.3 to reflect content (environmental parameters)

   Answer: The section title was corrected. (line 168).

5. L. 158: Do you mean that observations were hampered during storms, or that visibility decreases with higher suspended dust concentrations? Please clarify. If the latter, simply replacing "limited" with "decreased" should do the trick.

   Answer: The visibility decreases with higher suspended dust, therefore, we changed the word to decreased (line 180).

6. [important] L. 169: “SST anomaly”: I find this quite confusing. Usually in climatology, anomalies refer to a parameter relative to a reference time period (at the same location). In Cropper et al. 2014, I see no obvious mention of this "SSTa" index, rather upwelling indices (UIΔSST = SSTcoast - SSTocean), using grid cells 5° longitude apart, which is ~500 km, not 200 km as defined here.

I am not saying this parameter is not useful, rather that its definition and labeling need justification. Was it used anywhere else (please provide reference and rationale)? If not, why call it anomaly, as opposed to "200 km longitudinal SST gradient" or some locally-defined upwelling index?

Answer: I did not realise that word “anomaly” only refers to the temporal dimension. I have changed the term to upwelling index (UI). Moreover, studies conducted on the sediment trap data have found that surface waters 200 km away from the sediment trap are not strongly influenced by the colder upwelled waters, making them already suitable for quantifying UI (lines 191 - 194).

1. [important] L. 189. Was the monthly average plot (panel c in figure 3) also generated using this patched/extrapolated time series? And how did you attribute individual samples to a specific month for the summary? I don't see stated whether the cup opening/closing/mid date was used, or preferably, a daily time series was generated, and whether a time lag was applied (e.g., 10 days like above?).

   Answer: Explanations have been added to the respective sections in the methodology. In general, the steps are: each dataset was plotted including the 10-day lag time. And then we calculated the monthly average using the “pivot table” tool in Excel. The data points in dinocyst graphs were taken from the mid date (lines 166 – 167 and lines 203 - 204).

2. [important] L. 189. You should justify the use of Morlet mother wavelet. It is central to this paper and deserves a bit more light. Why it is well suited for natural phenomena, that it is complex (real + imaginary component)… see for instance Torrence of Compo 1998, 10.1175/1520-0477(1998)079<0061:apgtwa>2.0.co;2 p.66.

   Answer: We included the additional clarifications in the updated version of the manuscript (lines 216 - 219).

Results

1. [important] L. 201-202. These cyclicities make sense in this natural setting. However, please check where you placed the horizontal lines on all the power spectra (along the vertical, "period" scale) as the lines showing 180 days and 360 days are placed mid-way between bounding tick marks... but the scale is not linear (period for each line increases by a factor of 2). Easy to check in Matlab by clicking on the line (will show at least the frequency that you can convert to period).

   Answer: Those cyclic lines were drawn based on periods shown in PaST as the warmest spectra pointed to ± 5 days of the 360 and 180 days. It is a coincidence that those periods appeared in the middle of two scales. For example, in total dinocyst data, the warmest spectra showed the period of 361.46 and 181.95 days. Furthermore, we added the periodogram of each time series to support those cycles as suggested by the other reviewer (In Appendix; Fig. a1 - a3).

2. [important] L. 201-202. I don't see any solid lines in the power spectrum (other than the cone of influence). Were any of the coefficients significant (below the p=0.05 threshold)?

   Answer: The caption was changed to black lines. Furthermore, almost all significant lines in the dinocyst time series are located between the lighter and darker blue spectra; therefore, they have been thickened (Caption Fig. 3 as well as Fig. 3 &4).

3. L. 237: Maybe mention that all the high frequency variations detected in several spectra are not discussed because they cannot be resolved / compared with the dinocyst time series.

   Answer: The correction has been implemented (lines 275 - 277).

Discussion

1. L. 279: Fig. 7 is a nice summary figure that is important to anchor the discussion on cyclicities with more tangible measurements - well done.

   Answer: Thank you. But we need to mention that the colour of wind data was changed to blue to meet the criteria of Coblis, as addressed by the Editor (Fig. 7).

2. L. 318: Again, especially if you use the word "significant", you need to show the solid lines on the power spectrum.

   Answer: Thank you. Corrections have been implemented (Caption Fig. 3).

3. [important] L 346: On discrepancy between trends in wavelet spectra and cyst production time series. Sure, but the "intensity" in cyclicities (red colors in

wavelet spectra) only refers to the strength (or clarity) of cycles, that is, how well they correlate with the Morlet at any step, not the amplitude of highs and lows in the time series. So no real contradiction here between strengthened cyclicities and relatively lower cyst production in Phase III.

Answer: The statements have been revised for improved clarity (lines 410 – 412).

However, this highlights a missed opportunity that I think the authors should address. Your figure 4 nicely dissected the overall signal of total dinocyst production of Fig. 3b into ecologically meaningful groups. What Fig. 4 shows well is which groups have driven the cyclicities (in total dinocyst production) over the time series: groups A and D were more influential in the first half of the time series, and groups B and C became prevalent in the second half (Phase 2 can be seen as transitional)... as you describe elsewhere. To me, it suggests phyto- and microzooplankton is driven less by dust input over time, with more important contributions from "upwelling" and "cosmopolitan" groups. I think it agrees with the data from Roza et al. 2024 fig. 6F. While ecological implication were probably more the focus of Roza et al. 2024, your wavelet analyses at least confirm these "ecological" findings in the cyclicities.

Answer: Thank you for the suggestion. We have rewritten some parts of the appointed paragraph to highlight the shift in the dominant group over time. This statement is also included in the conclusion (lines 401 – 406 and lines 449 - 452).

Figures

1. 681: CVC not shown in figure 2.

Answer: The correction has been implemented (Fig. 2).

2. 689: I don't see any solid lines in the spectrum (other than cone of influence).

Answer: This issue has been addressed (Fig. 3and 4).

Captions of figures 4, 5 and 6: consider replacing the repetitive parts with a shorter statement like “Wavelet color spectra, lines and cone of influence as in Fig. 4”.

Answer: This part in the captions of Fig. 4 to 6 has been shortened.

Figure 7: For better readability, I suggest moving the legend for Dust-storm (N. Airport) to the right, so SST legends are displayed by the left panel and dust legends by the right panel.

Answer: The legend has been repositioned for better readability (Fig. 7).

Table 1: Please spell out genus names (*Protoperidinium*, *Lingulodinium*) as they are not mentioned anywhere else in the text.

Answer: The genus names have been added (Table 1).

Comments from Reviewer 2

This paper attempts to compare an 18-year long record of organic-walled dinoflagellate cyst fluxes with environmental conditions in the upwelling region off Cape Blanc (NW Africa). The authors chose to use spectral analysis to investigate cyclicity in the dinocyst and abiotic parameter signals and assess if the later can explain the former.

Overall, this study would benefit from further analysis to confirm (or not) if there is a statistical link between the two sets of variables. I strongly recommend trying a cross-wavelet analysis or a wavelet coherence, using the same time resolution adopted for the dinocyst records (15 days). R package 'WaveletComp' or W2CWM2C could be used (the second one produces heatmaps), for instance.

The lines in the following answers correspond to the lines in the annotated manuscript.

Answer: We thank you for the suggestion. We have implemented wavelet cross-correlation between total dinocyst production and each parameter (Fig. 8).

The text contains some inaccuracies (I have made a number of corrections/suggestions to the text) that need to be corrected. I tried to correct the English, but the text contains too many "the". It is also quite repetitive in places.

Answer: All suggestions in the text have been implemented.

Figure 2: Include a wider context map. Include Cape Verde in your smaller map.

Answer: The map has been zoomed out to include Cabo Verde. We believe that a wider context of this corrected version will not bring additional information since this figure aims to show the hydrography of the area and temporal changes of the upwelling, not the disparities of the upwelling characteristics in this region. Moreover, the territory north of Mauritania is still a subject of significant discussion on the geopolitical side. That is why we are advised to only show this part of the upwelling region (Fig. 2).

Figures 3 to 6: It is mentioned solid lines but they are not on the spectra. You need to include a Periodogram (easily done in PAST). You also need to include the standard deviations in your plots of monthly average of [variables].

Answer: The figure caption has been updated to include black lines. Most of the significant lines in the dinocyst time series fall between the lighter and darker blue spectra, making them less visible. We have included periodograms, but they will be placed in the appendix since they serve mainly to confirm the cycles identified in the wavelet graphs (see Figures 4–6 and the Appendix).

Figure 7: Please indicate if it is total dinocyst flux export in the caption and in the legend.

Answer: The correction has been implemented (line 851).

Table 1: Please correct the following:

- The taxon list of dinocyst groups…
- Dinocyst taxa
- *Echinidinium aculeatum*

Answer: The correction has been implemented (Table 1).