Response to reviewers

"Sedimentary organic matter signature hints at the phytoplankton-driven Biological Carbon Pump in the Central Arabian Sea"

Response: We gratefully acknowledge the time and effort the reviewers took to evaluate this manuscript, and specifically, the supportive comments and positive criticism from two reviewers. We replied to all points raised by the reviewers and took most of their suggestions, or rebutted.

Reviewer1 (Ralf Schiebel)

The manuscript of Medhavi Pandey and coauthors on 'Sedimentary organic matter signature hints at the phytoplankton-driven Biological Carbon Pump in the Central Arabian Sea' presents new and significant data on a topic of general interest. However, as the second paper on the same samples and along a similar scientific avenue following the paper of Pandey et al. (2023, Environmental Monitoring and Assessment, 195/1), I would suggest a broader appreciation of the first paper, i.e., to build on the first paper and not just reusing the same data. By doing so, a clearer distinction of the two papers as stand-alone contributions would be possible. By a clearer distinction, the two papers may receive more visibility, and may be better cited in the upcoming literature. Following a clearer distinction of the two papers, the Abstract and Conclusions may need to be reorganized.

Response: We are thankful to Dr. Ralf Schiebel for providing valuable insights and suggestions that improved the manuscript substantially. We agree with his mindful analysis about highlighting the earlier publication along with the recent manuscript. Accordingly, we have amended the manuscript. We also posted the data to an open data depository (Mendeley data) and the doi is also given (Reserved DOI: 10.17632/xm4nxzdxb2.1) and will be active in 3 days.

I believe that an improvement of syntax and language, as well as the figures, would enhance the overall quality of the paper. Overall, I would suggest to use the present / present perfect tense when presenting the results, which allows a more dynamic reading. Finally, I would suggest to accept the paper for final publication following major improvements. To support revisions of the manuscript, I provide an annotated pdf file.

Response: We express our sincere gratitude for supporting our manuscript. We highly appreciate the thorough comments throughout the manuscript to improve the overall quality. However, there are a few comments as given below that we could not follow and hence request to elaborate.

Line 52: "Kemp paper"

We did not understand which paper from Dr, Alan Kemp was referred to in this context and to support which statement.

Line 84: "Müller et al., 2011" a comment is given as: "2001 and" this is not clear.

Finally, the figures and tables should be improved. For example, the panel a of the Fig. 1 does not show the water-depth related differences discussed in the paper, because all of the sampling

sites are shown in the same kind of blue indicating the water depth from 2000-4000 m (the Fig. 1 is better in the 2023 paper). Please find detailed suggestions in the annotated pdf file.

Response: We modified the figures as suggested.

Comment on "Conclusion"

"This study aims for the first time to elucidate phytoplankton-driven particle flux to the sea floor using sedimentary organic biomarkers from the central Arabian Sea."
…… no, this was already done by the same author in his 2023 paper.

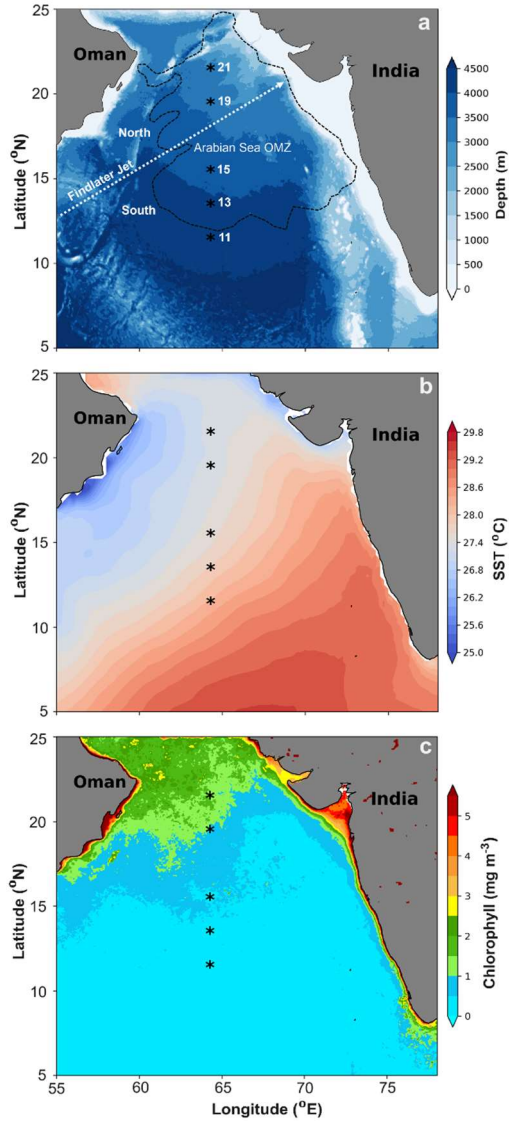
Response: We understand the comment by the reviewer, however, in this study, we emphasized the usage of lipid biomarkers, whereas, the earlier study dealt with diatom frustules. We will rephrase this to clear up misunderstandings.

Other comments about the figures

Fig. 1 "Water Depth (m) - this figure should show the differences in water depth, which are discussed as decisive for the different dissolution rates discussed in the manuscript."

Response: We include this information in Fig. 1, the depth contour has been implemented to improve visibility.

Design and of the two panels A and B including scales and legends should be the same

Response: We have made this change.

A third panel on the trophic conditions, i.e., high vs. low productive areas would be useful. For example, nutrient (e.g., nitrate) or chlorophyll concentrations could be shown. Data are available from, e.g., LEVITUS and MODIS.

Response: Thank you for the suggestion. We have now included the averaged Chlorophyll-*a* data for 2017-2020. We also display now the seasonal variation, but the average values remain in the main figure.

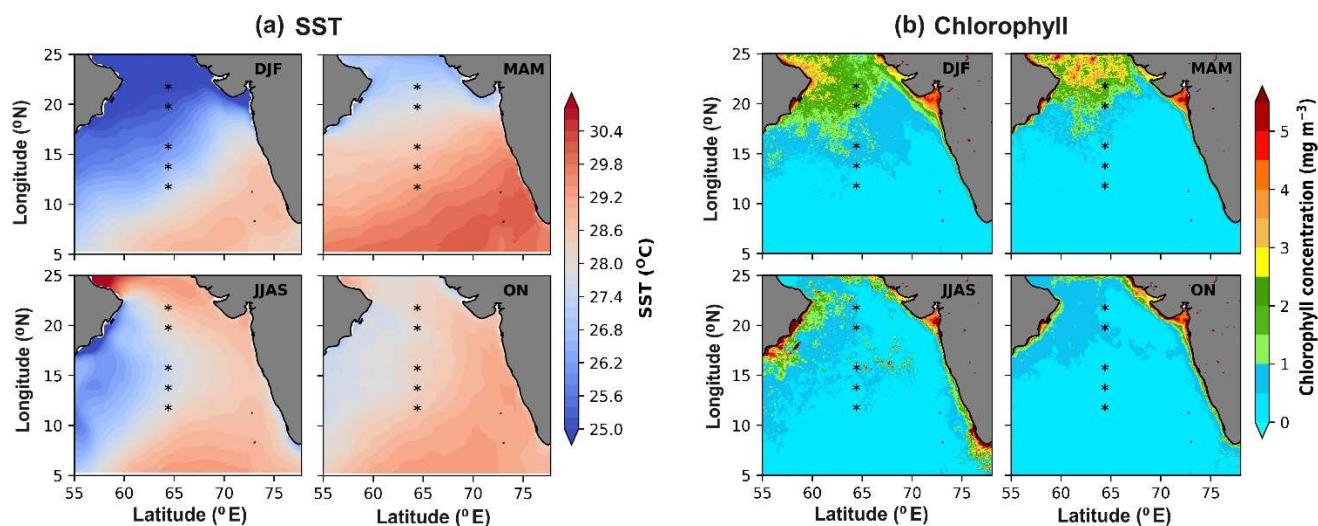



Fig. 3: what are the orange and green circles?

Response: Please note that this is a bubble plot and the circles represent the relative % of individual diatom taxa to the community. Hence, the circles are according to the color code as stated against different diatom taxa at the bottom of the panel.

Fig. 3 legend Top 0.5 cm or top 1 cm?

Response: "top 1 cm".

Fig. 4 legend: "I cannot find any information on abiotic factors here. What is considered abiotic here?"

Response: Now the biotic and abiotic factors have been mentioned in the legend as follows:

"RDA biplot shows the interrelationship between cluster one that includes diatom frustules, biomarkers, radiolarians (shown with blue arrows), and cluster two comprising TOC; TN, TIC, TOC:TN; SST (shown with red arrows). The names of diatoms genera are marked as "Sp." and are mentioned in the top left side of the panel. Axis 1 and axis 2 explained nearly 97.2% of the variability."

The same changes are also made in the method section.

Fig. 5

- This panel is not needed, as already shown in the Figure 1
- Please make the two panels on North and South coherent
- Intermonsoon and premonsoon

Response: Regarding the first point for Fig. 5, we completely understand the point raised by . However, at this point, we would like to request the reviewer to allow us to keep the station location, as it gives a holistic figure about the entire process in this manuscript.

We modified the figures and have tried to make them coherent.

About the last point raised by the reviewer, we would like to stress that the southern samples remain low productive zones throughout the year compared to the north and this feature is now visualized in the new Figure.1c Chlorophyll-a annual average. Consequently, we keep Figure 5 unchanged.