

Interactive comment on “Transparent exopolymer particle binding of organic and inorganic particles in the Red Sea: Implications for downward transport of biogenic materials” by Abdullah H. A. Dehwah et al.

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Reviewer #2. Comments and Responses General comments: Dehwah et al. investigated the vertical profiles of concentrations of transparent exopolymer particles (TEP) and other forms of organic matter in the Saudi coast of the Red Sea as well as microbial cell abundances and several kinds of hydrological parameters. The results showed that particulate TEP concentration (p-TEP) decreased at a diminished rate with depth compared to other organic matter compositions, indicating that it persists in moving organic carbon deeper into the water column. The vertical distributions of

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diverse organic matter compositions, the relationships between TEP and microbes, and the microbial impacts on organic carbon transport into the ocean are indeed worth studying. However, I am not convinced for its publication in BG with the current form. My major concerns are shown below. Response: We agree with the description of the paper content. We will address the issues the reviewer has raised. 1. Many paragraphs need to be re-written for a clear logic. The results section needs to be re-organized to focus on main/important findings. Response: We will try to do so, but are unsure on what reorganization the reviewer is suggesting. 2. The uses of algae, picoplankton, cyanobacteria, and Prochlorococcus are completely confusing, making this manuscript hard to understand. Response: We do not agree. Another reviewer has not raised this issue and other members of our faculty of marine science believe that it is quite clear. 3. The analysis is too simple and the conclusions are too speculative only based on regression analysis. Response: It is most difficult to respond to this comment in that the reviewer makes no suggestions regarding what statistical approaches we should use. We have added some additional statistical analysis including multi-variant analysis and ANOVA. The results have confirmed what we found in the various regression analyses made. We have added the spreadsheet with the detailed analyses to the Supplemental Information File. Specific comments: Lines 54 to 56: What's the meaning of "biomass"? particulate organic material or bacteria? Hard to understand. Response: We do not understand what the reviewer is suggesting. The sentence appears quite clear to us. Lines 91 to 94: This paragraph should be incorporated into the next paragraph. Response: We added the single sentence paragraph to the beginning of the next paragraph. Lines 110 to 113: The compiled data were published already? If yes, citations need to be added. If not, use the data as new data. Response: The references have been added. Line 121: Where is the site D? not shown in Fig 1. Response: The location of site D has been added to Figure 1. Lines 136 to 140: This paragraph should be incorporated into the previous sensors part. Response: We do not agree. The paragraph must stand along so that the English is correct. Long paragraphs with multiple subjects are not desirable.

Lines 144 to 147: This paragraph should be incorporated into the next paragraph. Response: We have merged the paragraphs as suggested. Lines 146 to 147: delete. Response: We edited the paragraph to remove the redundancy. Lines 148 to 149: This sentence should be placed before “Algal cell counting. . . .”. Response: Additional editing was done on the paragraph. Lines 151 to 152: This sentence should be placed in the next paragraph of bacteria counting. Response: Additional editing was done on the paragraph. Lines 156 to 157: The use of algae, cyanobacteria, Prochlorococcus, and pico/nanoplankton is very confusing! Cyanobacteria include Prochlorococcus and Synechococcus; picoplankton include cyanobacteria and pico-eukaryotes. Algae include cyanobacteria here? These confusions need to be clarified throughout the manuscript. Response: We restructured the sentence to note that cyanobacteria are not algae. Lines 191 to 192: The size ranges were repeated in the introduction section. Delete here. Response: The sentence was repeated. Line 231: This part is too long and wordy. The authors should emphasize the key points related to the conclusions. Response: We do not agree. The change in the slope at 115 m shows the possible presence of two water masses which requires us to carefully describe the profile conditions. We added minor text at the end of the halocline description. Lines 283 and 366: Descriptions of the two sections are very confusing. Please see my comment above. Response: We added site D to the text, otherwise the text is clear. Line 285: the sum of what? Response: As stated, the sum of the total algae and cyanobacteria. Line 286: Cyanobacterial abundances are not shown in Table 1. Response: We corrected the heading to show it as Total Algae and Cyanobacteria in Table 1. Lines 348 and 389 to 392: Which samples are offshore samples and which are nearshore samples? clarify. Response: We clarified by adding a reference to Table 1 in the first sentence of the paragraph. Line 364: Discussion section included many results descriptions and needs to be reorganized to focus on the deep discussion. Response: We do not agree that all of the text should be on the deep water profile. We are not sure why the reviewer is suggesting these changes which are not defined. Lines 396 to 401, 405 to 405, 437 to 439, and 454 to 458: too speculative! There is no

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supporting evidence. Only vertical distributions of parameters and regression analysis are not enough. Response: We have clearly stated the evidence for our interpretation of the data. What additional evidence could be collected? Perhaps the reviewer could provide us with some alternative interpretations of the data that we could add to the text. Additional statistical work on the dataset would not yield any significant results due to the small sample size in the site D profile. Lines 406 to 408: Is there overlap between biopolymers and TEP? If so, there is an internal correlation between them. The significance of regression analysis means nothing. Response: TEP consists of larger acidic polysaccharides and proteins as well as smaller molecules. Some of the TEP material occurs with the biopolymer fraction of NOM and many proteins are likely contained with the humic substances. The reason that there is a statistically significant relationship between p-TEP and the biopolymer fraction is the common occurrence of the polysaccharides. The statistical relationship is significant. Lines 431 to 432: The data are from the published paper? insert citations. Response: The references have been added. Lines 464 to 471: this part belongs to the result descriptions. Response: We do not agree. Table 1: give references; indicate what mean for total algae. Response: The references are given at the end of the table and correlated to the numbers. Table 2: Which kind of regression analysis? Which samples are nearshore and offshore samples respectively? Why do many p-values of <0.05 correspond to “N” (significant)? Response: The regression tests the relationship between the two parameters. The p-value used for determine of significance is a standard. Fig. 1: Site D is now shown. Response: This has been corrected. Fig. 2: what do a) and b) indicate? Response: The curve labelled a is for the analyses conducted at samples from sites A, B, and C. The b label was developed for site D. We have added text to the table to cover this issue. The a) and b) indicate the calibration curves used for the study. The reason for two calibration curves was: the alcian blue solution prepared for staining should be used for no more than 1 month, otherwise the alcian blue solution should be filtered with $0.2 \mu\text{m}$ filters and a new calibration curve should be prepared. In this study, the execution period was more than 1 month, so two

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calibration curves were prepared. Fig. 4: the unit of salinity should be ppt. Response: The PPM has been corrected to ppt. Figs 5 and 6: need error bars. The figure legend is unclear! Response: Error bars are not used on flow cytometer data by convention. As a group, we have published 15 papers with this type of data and no journal has ever required error bars. Fig. 6: use dot-lines. Response: No. We do not agree. Fig8: needs error bars. Algae count figure is repeated. Response: Error bars are not used on flow cytometer data by convention. As a group, we have published 15 papers with this type of data and no journal has ever required error bars, particularly for LCOCD data. The algal data was presented in this figure a second time for comparison.

Please also note the supplement to this comment:

<https://www.biogeosciences-discuss.net/bg-2019-59/bg-2019-59-AC1-supplement.pdf>

Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2019-59>, 2019.

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