Dear Dr. Naqvi,

Thank you for selecting our article for peer-review process of Biogeosciences (BG).

We have completed the revisions, which was suggested by both Reviewers 1 and 2. You can kindly find the revised manuscript (abstract, text, figures, tables, references) and supplementary materials attached as separate files in the online submission system.
Kindly find our response to reviewers below. We tried to handle every comment with maximum care and tried to response the questions of reviewers in detail. While doing this, all comments and recommendations were carefully addressed, point-by-point for the issues raised in the reviewers comments. We also included a suitable rebuttal to any specific request for change that we have not made.
We specially thank to the second reviewer for the extensive suggestions. We incorporated most (but not all) of the revisions suggested. During this revision process, we have payed special attention to removing duplications in the text. For those edits not adopted, we feel that the short phrases are necessary for transition and stating the whole argument.

We would like to present our acknowledgements for sharing your time and effort.

Kind Regards,

Dr. Oguz Yigiterhan,
Corresponding Author

Response to Comments of the Reviewer # 1

"The Trace Element Composition of Size Fractionated Suspended Particulate Matter Samples from the Qatari EEZ of the Arabian Gulf: The Role of Atmospheric Dust" by Yigiterhan et al.,

The paper presents new data set on high precision measurements of trace element concentrations in bulk particulate matter of two size fractions collected by net tow samples from the EEZ of Qatar, Arabian Gulf. The researcher differentiated between lithogenic and biogenic sources of the elements implying correction using dust composition. Furthermore, relation between the excess metal concentrations with distance from the coast was used to ascertain the anthropogenic sources. The work carried out is impressive and will significantly improve the knowledge of biogeochemistry of trace elements in this region. Overall, the manuscript is clear and easy to follow. However, I suggest minor revision, which will further improve

the scientific understanding of the study, performed as well the quality of the manuscript. The field campaigns carried out during this research is separated by not only years but season. First campaign performed during October 2012 where as in 2014 samples were collected in April. Referring to Table 2 and 3, we see prominent changes in elemental compositions (both total and excess) particularly in the areas, which were revisited (Doha and Dukhan).

Such seasonality is not reported or discussed.

- Response to comment:

We have not specifically focused on temporal and seasonal variations of size fractionated SPM in our manuscript. We have conducted 2 sampling campaigns in October 2012 and April 2014. The second sampling campaign was not the continuation or repetition of the first one. Due to logistic reasons, we were able conduct the 2nd sampling after a while. Additional samples were collected during a third cruise to in October 2014. The data from these samples will be used in a later publication (Yigiterhan et al., in preparation).

During the 1st sampling campaign, the size fractionated net-tow samples were collected from off-shore stations (away from the coast and bay areas), we specially focused to catch the influence of the intense anthropogenic impact of oil and gas industry around the islands and deep water rings, heavy industries located along the southeastern coast, offshore hydrocarbon extraction fields etc. Doha and Dukhan offshore stations were also part of the campaign, which were selected to reflect the influence of desalinization plants and oil fields. All samples were collected out of the bays, away from the coast, relatively loaded with less SPM and reflecting more integrated coverage of the EEZ.

However, in 2014 sampling campaign, as you can see from Figure 2; sampling was conducted from semi-closed bay areas for Doha and Dukhan stations, both from the East and West sides of the Qatar Peninsula, reflecting completely different water characteristics, under large anthropogenic effect due to more re-suspended sediments and dust load. The samples were collected along a linear transect inside the Bays and average composition was used for interpreting the data in the manuscript.
That is why we have different metal concentrations between 2 years for the same “named” stations (Doha and Dukhan). These differences in concentrations may not point out the temporal variations.

Kindly note that we tried to reflect these compositional variations in Figure 6 and 7 for small and large size fractions and for two campaigns with different sampling characteristics. Rather than focusing on temporal and seasonal variations, compositional change of SPM versus distance were targeted for two different size fractions.

<u>Specific comments have been mentioned below:</u>

Comment 1: Line 3-5, Page 2 and Line 12-17 Page 7: As stated, researcher didn't manually characterized phytoplankton and zooplankton fractions in their two net-tow samples. It would be wise not to generalize 50_m fraction as phytoplankton and 200_m as zooplankton. Particularly a 50_m net-tow would also capture micro zooplankton. In fact, in tables and figures the author took care about this by stating bulk plankton or small net tow.

- This was corrected. The use of phytoplankton and zooplankton were removed. Now refer only to 50 and 200 mesh as small and large size fractions.

Comment 2: Line 6-7, Page 2: The line is misleading. Sampling campaigns were distinctive with varying space and time. 11sites were sampled during 2012 whereas in 2014 six stations were sampled.

- This line was corrected

Comment 3: Line 30, Page 2: Multiple key words implying same meaning can be removed. E.g., Particulate matter and marine particle, Elemental composition and Trace metal etc.

- This was fixed, multiple key words were removed

Comment 4: Line 26, Page 6: Shraawoo's Island

- The name of the island was corrected

Comment 5: Page 6-7: Please provide depth range among the sampling locations.

- The water maximum bottom depth range for 2012 sampling stations were varying between 12 to 55 meters depth. However for the 2014 sampling campaign, the sampling depths were varying between 2 to 5 meters in quite shallow bay areas.

Comment 6: Line 20, Page 13: It is mentioned that "Unfortunately, neither Ca nor P analyses were included in this data set.", however, authors presented Ca/Al data from net tow samples in Fig.6

- The confusion was carefully corrected

Comment 7: Line 12, Page 14: dust instead of "duct"

- The misspelling was corrected

Comment 8: Line 8, Page 15: HAc-HyHCl instead of "HAc:HyHCl"

- The formula was corrected

Comment 9: Line 15, Page 19: Ca is mentioned as biogenic/anthropogenic element but not included in table 6.

- We have fixed this. The text was revised and Ca was deleted from the list of elements in Line 19. The Ca concentrations were analyzed in the 3'rd data set (in publication) but has not been included as a separate table into this manuscript to prevent data dump. On the other hand, kindly note that Ca was in the list of elements analyzed for bot leached and unleached data set of Qatari dust samples. This was essential to observe the influence of $CaCO_3$ dissolution in weak acidic conditions.

Comment 10: Line 10, Page 20: Study occupied entirely in the EEZ of Qatar and doesn't represent entire Arabian Gulf.

- The text was revised

Figure Captions:

Figure 1: Figure represents sampling locations during 2012 campaign only.
- Corrected

Figure 2: Near shore sampling were performed during 2014.
- Corrected

Figure 7: Refrain from stating phytoplankton
- Phytoplankton was removed

Missing References:

Turekian 1977
- The missing reference was added

Knauer and Martin, 1981
- The missing reference was added

Response to Comments of the Reviewer # 2

The manuscript on The Trace Element Composition of Size Fractionated Suspended Particulate Matter Samples from the Qatari EEZ of the Arabian Gulf: The Role of Atmospheric Dust by Yigiterhan et al presents work on the suspended particulate matter (SPM) from the Qatari EEZ. The samples have been collected during October 2012 and 2014. They have also used dust samples from the land that were previously collected. Trace element composition data of SPM is compared with that of leached, unleached dust, UCC and also applied various corrections like salt lithogenic corrections to get the clear idea of the source of the SPM. They have normalized the data with Al and also calculated excess metals using atmospheric dust as the background and fate of the dust reaching the EEZ is discussed. With help of the data, the authors have distinguished between lithogenic and anthropogenic trace metals reaching the EEZ. The data is of interest as this is the first report and includes systematic study that will help in understanding the biogeochemistry. Abstract, Introduction, Study area, methods, Results discussions and conclusions are clear. Overall, manuscript is nicely written with the clarity that readers will understand. This manuscript has potential and I would suggest that the manuscript may be accepted with moderate revision as I find that there are a lot of repetitions in the text. The text could be further improved. Specific comments have been included in the pdf attached.

Comment 1: I would suggest to reduce the number of figures or add them to the supplement

- We feel that all Figures are required and made no changes for keeping the integrity and completeness of the manuscript. We are kindly requesting keeping the figures inside the manuscript.

Comment 2: Results and discussion could be combined as same things are repeated.

- We also feel that the best presentation separates Results from Discussion; because of this reason we preferred to keep Results and Discussion separately.

Comment 3: Please check time of sample collection October or April?

- The text has been revised. Months added in to the manuscript text.

Comment 4: Check tables 2 and 3- same stations during two different years? Change the tables or the captions.

- We have done goal oriented research sampling in 2012 and 2014 campaigns and added metal concentration data in Table 2 and 3. Kindly see the clarification below that was done for the comments of the other reviewer:

“We have not specifically focused on temporal and seasonal variations of size fractionated SPM in our manuscript. We have conducted 2 sampling campaigns in October 2012 and April 2014. The second sampling campaign was not the continuation or repetition of the first one. Due to logistic reasons, we were able conduct the 2nd sampling after a while. Additional samples were collected during a third cruise to in October 2014. The data from these samples will be used in a later publication (Yigiterhan et al., in preparation).

During the 1st sampling campaign, the size fractionated net-tow samples were collected from off-shore stations (away from the coast and bay areas), we specially focused to catch the influence of the intense anthropogenic impact of oil and gas industry around the islands and deep water rings, heavy industries located along the southeastern coast, offshore hydrocarbon extraction fields etc. Doha and Dukhan offshore stations were also part of the campaign, which were selected to reflect the influence of desalinization plants and oil fields. All samples were collected out of the bays, away from the coast, relatively loaded with less SPM and reflecting more integrated coverage of the EEZ.

However, in 2014 sampling campaign, as you can see from Figure 2; sampling was conducted from semi-closed bay areas for Doha and Dukhan stations, both from the East and West sides of the Qatar Peninsula, reflecting completely different water characteristics, under large anthropogenic effect due to more re-suspended sediments and dust load. The samples were collected along a linear transect inside the Bays and average composition was used for interpreting the data in the manuscript.

That is why we have different metal concentrations between 2 years for the same “named” stations (Doha and Dukhan). These differences in concentrations may not point out the temporal variations.

We tried to reflect these compositional variations in Figure 6 and 7 for small and large size fractions and for two campaigns with different sampling characteristics. Rather than focusing on temporal and seasonal variations, compositional change of SPM versus distance were targeted for two different size fractions.**”**

Comment 5: Please also note the supplement to this comment:
https://www.biogeosciences-discuss.net/bg-2019-183/bg-2019-183-RC2-supplement.pdf

- We thank the reviewer for the extensive suggestions. We found them very useful to improve the quality of the manuscript significantly. We incorporated most (but not all) of the revisions suggested, paying special attention to removing duplications. For those edits not adopted, we feel that the short phrases are necessary for transition and stating the whole argument.