

Atmos. Chem. Phys. Discuss., referee comment RC1
<https://doi.org/10.5194/acp-2022-32-RC1>, 2022
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Comment on acp-2022-32

Anonymous Referee #1

Referee comment on "Polycyclic aromatic hydrocarbons (PAHs) and their alkylated, nitrated and oxygenated derivatives in the atmosphere over the Mediterranean and Middle East seas" by Marco Wietzoreck et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-32-RC1>, 2022

Polycyclic aromatic hydrocarbons (PAHs) and their alkylated-, nitro- and oxy-derivatives in the atmosphere over the Mediterranean and Middle East seas

Marco Wietzoreck and al.

This manuscript provides a study of the concentrations in the gas and particulate phase of the PAHs, RPAHs, NPAHs and OPAHs in the Mediterranean Sea and around the Arabian Peninsula including the Red Sea, Arabian Sea and the Arabian Gulf region. The study includes results about PAC particle size distribution and information about their sources in these regions.

Overall, the manuscript needs several improvements. Some parts (e.g. 3.1) are quite long and hard to follow and must be improved. In addition, the manuscript suffers of several problems in terms of chemical analytical procedures, data validation, analysis and interpretation and thus, on the results obtained. This is especially true for the source apportionment part and as it stands, the methodology applied is largely perfectible and could be improved. The probable objective of the authors was to get an understanding of PAC sources in the region. However, the PMF source apportionment approach made is not clear. I guess (not sure cause it is not clear) the authors first apportioned the PM to later understand the PAC sources. If it that the case, some major PM sources, e.g. sea salt, have not been considered at all and it is difficult to understand. The inclusion of alkylated PAHs in the PMF approach, or by applying multi-linear regression analysis or PCA between PMF outputs and key PAH ratios, would be of great benefit instead having a questionable use of PAH diagnostic ratios alone. The source attribution using NPAHs is not well done and analysed in the wrong way and so, the following discussion on the significance of the OPAHs and NPAHs sources should be removed. Finally, the PAC particle size distribution is poorly innovative and informative and could be here again largely improved.

In conclusion, the authors have really a very good database and can improve the data analysis performed and the results obtained. Thus, I would not recommend the publication of this paper in ACP in the current form. I strongly encourage the authors to resubmit their paper after major changes and revisions. Detailed comments and suggestions are provided directly into the pdf file of the text.

Please also note the supplement to this comment:

<https://acp.copernicus.org/preprints/acp-2022-32/acp-2022-32-RC1-supplement.pdf>