

Interactive comment on “Technical note: Emission factors, chemical composition and morphology of particles emitted from Euro 5 diesel and gasoline light duty vehicles during transient cycles” by Evangelia Kostenidou et al.

Anonymous Referee #2

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The manuscript acp-2020-842 by Kostenidou et al. presents a relatively comprehensive analysis of emissions from Euro 5 diesel and GDI vehicles. The work is well done, thoroughly discussed, and presents useful data. However, the manuscript is possibly more suited to a journal focussed on emissions and air quality, as it represents incremental progress. However, ACP has published similar work before. This decision is ultimately the Editor's. However, considering the thorough analysis and useful data, I would recommend publication in ACP after the following revisions.

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Discussion paper



Major comments

1.

The manuscript is not a technical note in my opinion. The analysis and literature discussion are thorough. There are no new technical advances. The label does not seem appropriate.

2.

The abstract, manuscript, and figures do not emphasize enough that the diesel engines used DPFs while the gasoline engines did not. Of course particulate emissions were lower after the DPFs.

Line 14 should be changed to "BC ... emission factors varying from 0.2 to 7.1 mg/km for gasoline cars and 0.003 to 0.08 mg/km for diesel vehicles with DPF". Every other statement comparing the two should include "with DPF". Scientifically, the manuscript is effectively reporting the efficacy of the DPF by comparison with the gasoline case. However, this does make sense since the vehicles were all commercially available.

3.

This manuscript relies heavily on the methodology of Herring et al. (2015) to estimate speciated PAH concentrations. However, the Herring et al. 2015 methodology is not analytically reliable. The authors did not use any laboratory standards, and had no way of knowing whether PAHs had fragmented prior to their identification. Therefore, major potential issues, such as the relative sensitivity of the method to PAHs with different functional groups (which are extremely likely to fragment during electron ionization) were not explored.

Herring et al. (2015) only presented validation data from a photoelectric aerosol sensor, which is another indirect method of PAH quantification. If assumed accurate, the validation data from the photoelectric sensor imply that the accuracy of the AMS tech-

nique is at best 210% (calculated from their correction factors of 67 and 208).

Therefore, the published mass spectral interpretation of Herring et al. (2015) should not be taken as an analytical standard and should not be used in routine engine emissions analysis until further validation work is completed. The current manuscript presents misleading results, as most readers will assume that the authors used reliable methods such as GCMS when seeing the present manuscript.

The authors should delete Figure 4 and simplify Figure 5 to represent only "PAH" and "functionalized PAH" from the AMS data sets. If the authors wish to keep Figure 4 in the SI, they should add a comment to the caption to emphasize that the results are only estimated.

Minor comments

Line 42: Dallmann et al. 2014 also belongs in this list.

Line 90: Please briefly mention why 3 different dilution systems were used, and what differences could be expected as a result.

Line 142: Is conductive silicone really present in the tailpipe, or in the sampling system? The Timko citations did not discuss tailpipe tubing.

Line 215: "we conclude that both GDI5 and D4 emitted randomly oil droplets". Surely the emissions are not random, and surely the authors understand a little more than they are saying here. Do the authors mean that the lubrication oil emissions were not correlated with engine load, cycle period, etc.? Please improve the statement to represent a better scientific discussion.

Table 2: Define theta. $R = \cos(\text{theta in degrees})$. The text suggests that theta is a different parameter to R, when it is not.

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Figure 4: OPAH is not readable in light yellow text.

Figure 6: Add interpretation to the caption. I also suggest adding one of the micrographs from Figure S9 which show the tiny metallic particles, since this is a rare observation.

Data availability: I recommend that the authors upload a table with the data of Figure 7 instead of stating that the data are available on request.

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