

Interactive comment on “Impact of aftertreatment devices on primary emissions and secondary organic aerosol formation potential from in-use diesel vehicles: results from smog chamber experiments” by R. Chirico et al.

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Received and published: 16 November 2010

We thank the reviewer for his/her comments. For the revised version of the manuscript they were taken in consideration.

The manuscript is too long (roughly 30 pages) and it contains too many figures (14). In my opinion, this Interactive manuscript can be shortened and the clarity of presentation improved.

Originally we were discussing the option to present the material in two separate pa-

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pers but decided on providing one comprehensive paper. This mixes to some extent results of very general interest and results that are to some extent specific to AMS data interpretation. Overall we find it advantageous to provide the information in one long manuscript. We removed one Figure and put another into the supplementary material. We shortened paragraphs 2.3.6 and 2.4.

1. It would be helpful if the authors list the most important findings from this work in the conclusion section. As it is currently structured, the abstract contains more information than the conclusions.

We agree with the reviewer and we rewrote the conclusions

2. Although the authors list three vehicles with different exhaust aftertreatment systems, the vehicle with DOC and DPF is used for one experiment only (gas phase photooxidation, page 16085). This should be made clear in the introduction and experimental sections.

We provide the necessary changes made to lines 14-16 at p. 16059 and line 14 at p. 16062

3. The authors found vehicle exhaust consisted mainly of black carbon (BC) with a low fraction of organic matter ($OM/BC < 0.5$) at both idle and 60 km/h conditions. This is in contrary to some other reports (see for example Shah et al., 2004) that found much higher contribution of OC at idle conditions. The transfer line from the vehicle exhaust pipe to the chamber and the diluter (Fig. 1) were heated to 150 C. At this temperature, semi-volatile organic species would be mostly driven out of the particles. Can the authors comment on this?

The following information was already included in the paper: -The line from the tailpipe including the ejector diluter and the dilution air was maintained at 150°C to avoid condensation of SVOCs (p. 16060 lines 9-11); -In addition, experiments with the sampling line and the dilution air at 80°C were performed to evaluate the effect of the dilution

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temperature on POA and SOA formation. The concentrations of the POA and the aged OA from experiments at 80°C were within the range of concentrations obtained from the same type of experiments with the sampling line and the dilution air at 150°C (p. 16060 lines 17-21) -After injection, 5-10 minutes were allowed for homogenization and mixing of the exhaust in the bag. Following the mixing, instruments sampled for approximately 1 hour to characterize the primary emissions (p. 16061 lines 3-5)

Moreover, no significant change could be observed in the OM/BC ratio during the mixing time indicating that the partitioning equilibrium was reached quickly.

Some changes were made at p. 16071 (lines 13-14): Low OM/BC values were also measured for the Astra at the same conditions (idle and 60 km/h), and for other diesel vehicles, at the test bench facility of the JRC (Chirico et al., in preparation, 2010a). The OM/BC ratio can be vehicle specific (type of engine, temperatures, oxidation catalyst, etc) and it also depends on the dilution of the exhaust as already shown by Lipsky and Robinson (2006).

The following sentence was added in the paper:” In contrast, Shah et al. (2004) found a much higher contribution of OC than EC at idle conditions for a number of heavy heavy-duty diesel trucks.”

4. Page 16057, line 6: remove “as” before PAH

Done

5. Page 16061, line 20-22: please correct the sentence: “ for those species object of this work.”

“for those species object of this work” was removed

6. Page 16077, line 7: “..with as carbon number decreases?”

“..with as carbon number decreases” was removed

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 16055, 2010.

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