Atmos. Chem. Phys. Discuss., 7, S7786–S7789, 2007
www.atmos-chem-phys-discuss.net/7/S7786/2007/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Real-time characterization of particle-bound polycyclic aromatic hydrocarbons in ambient aerosols and from motor-vehicle exhaust" *by* A. Polidori et al.

Anonymous Referee #2

Received and published: 19 December 2007

General comments

This manuscript presents measurements of particles in Los Angeles and from dynamometer testing of diesel trucks. In the introduction, the authors make a good case for monitoring the temporal variation in polycyclic aromatic hydrocarbons (PAHs), which they are able to do with the photoelectric aerosol sensor. The work is comprehensive in its scope, spanning detailed size distributions and chemical composition to risk assessment. The particle characterization results contribute to knowledge about the relationship between size, black carbon, and PAHs as a function of time of day, in the case of ambient measurements, and engine load, in the case of dynamometer

measurements. My one quibble is that there is no linkage between the ambient and dynamometer measurements; they seem randomly thrown together. The writing and figures are clearly presented, although the accuracy in describing the figures could be improved (see specific comments below).

Probably as a result of the broad scope, the manuscript does not explore the dynamometer results as deeply as it could. Given that SCRT controls on diesel-powered vehicles are likely to become much more widespread in the future, the data associated with their testing are important. Greater emphasis could be placed on the magnitude of particulate reductions associated with the SCRT vehicles, whether zeolite versus vanadium makes a difference, and the relationship of emissions to engine load.

Specific comments

1. (p. 17483, line 6) Table 1 seems unnecessary, given that most of the information in it is the same for all three vehicles. The only differences between vehicles are the control technology (already explained in the text) and the mileage, which could easily be mentioned in the text.

2. (p. 17484, line 4) Was there any difference in weekday versus weekend concentrations?

3. (p. 17484, line 7) A lower mixing height in the morning would also contribute to higher ambient concentrations. The importance of the mixing height is borne out by the observation stated in line 12 that concentrations were 4-8 times higher between 09:00-11:00 than between 17:00-18:00, even though we would expect heavy traffic during the evening rush hour, too.

4. (p. 17484, line 26) The statement that the Zeolite SCRT vehicle is not equipped with any kind of catalytic trap is confusing given that the Methods section already described the SCRT system as containing selective catalytic reduction and a continuously regenerating trap. So does this vehicle have SCR only and no particle removal system?

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5. (p. 17484, line 26) Figure 2b does not show an obvious inverse correlation between PAS and EAD signals. Rather, it appears that PAS seems to go with accelerations, and EAD pops up on three separate occasions. When EAD is high, it is not obvious from the figure that the PAS signal is lower than it would be otherwise.

6. (p. 17486, line 1) Figure 3a certainly shows considerable spread in the PAS/NSAM ratio, but it does not appear to have "two branches." If there were two separate branches, I would expect to see an obvious separation between them. Instead, the data points seem to be continuously distributed between two boundaries.

7. (p. 17487, line 20) Same comment as above about the existence of "two branches."

8. (p. 17487, line 27) In Figures 5c and 5d, a shift from the nucleation to accumulation mode is not obvious. Does the line in the figure indicate the arithmetic mean or the median? The evidence for a shift should be quantified.

9. (p. 17488, line 5) The meaning of "bimodal bursts of the PAS signal" is unclear.

10. (p. 17488, line 11) The authors defined accumulation mode particles as those with diameters of 50-60 nm. Here, they claim that higher numbers of accumulation mode particles were observed at start-up, but in Figure 6b, it appears that the numbers are higher during acceleration compared to start-up. The explanation that follows about the catalyst not being warm enough to convert SO2 to particulate sulfate seems to contradict the claim. If the catalyst is supposed to convert SO2 to particulate sulfate and were not warm enough during start-up, then we would expect lower particle numbers (as suggested by the figure) during start-up.

11. (p. 17489, line 6) Provide units on the regression slope between the PAS signal and total PAHs. If the units are ng per cubic meter per fA, then the value of 17.5 is considerably higher than the manufacturer's range of 0.3-1, Arnott et al. 's (2005, EST, 39:5398-5406) finding of 0.11, and Wilson et al. 's (1994, Polycyclic Aromatic Compounds, 5: 167-174) finding of 1. Please look into this.

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Technical corrections

12. (p. 17476, line 12) "catalytic converted" should be "catalytic converter"

13. (p. 17477, lines 18-21) As written, the sentence makes it sound like the Pope study looked at PAHs, when in reality, it looked at fine particles.

14. (p. 17479, line 12) "Air Resource Board" should be "Air Resources Board"

15. (p. 17480, line 2) "Souvain" should be "Sauvain"

16. (p. 17491, line 8) The slope for methylnaphthalene is incorrect.

17. (p. 17497) Marr et al. (1999) is missing from the references.

18. (p. 17497) All Riddle et al. (2007a) authors should be listed.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 17475, 2007.