Atmos. Chem. Phys. Discuss., 5, S5105–S5107, 2005
www.atmos-chem-phys.org/acpd/5/S5105/
European Geosciences Union

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Sources and transformations of particle-bound polycyclic aromatic hydrocarbons in Mexico City" *by* L. C. Marr et al.

Anonymous Referee #2

Received and published: 17 January 2006

This paper compares PAH measurements by three different methods (time-integrated filter/solid adsorbent collection and GC/MS analysis, continuous aerosol photoionization, and aerosol mass spectrometry) during the Mexico City Metropolitan Area field campaign in April 2003. The paper is well written and presents new, important information concerning PAH measurements by continuous methods, and how these methods compare with the traditional, time-integrated filter-based measurements. I have only a few specific comments concerning the author's conclusions regarding specific PAH ratios and the relevance of these ratios to source apportionments (Section 4.2): 1. The authors conclude that the ratios of methylphenanthrene /phenanthrene reported

for diesel emissions are always >1 and those for gasoline emissions <1 (page 12753). This is not entirely true. For example, the ratio > 1 for newer gasoline vehicles has been reported (Zielinska et al., 2004). Conversely, the ratios <1 were observed for heavy-duty diesel vehicles (Fujita et al., 2006). Taking into account the large variations connected with state of the vehicle maintenance, vehicle age and mileage, fuel, type and condition of lubricating oil, emission control technology, vehicle operating mode (cold start, hot stabilized), engine load, and ambient temperature, this ratio is not a very good indicator of the relative contribution of diesel- versus gasoline-vehicle emissions. 2. Although the methylphenanthrene /phenanthrene ratio shown in Fig.1 increases from <1 for the morning period (7:00-11:00) to >1 for the day period (11:00 - 16:00), it stays >1 for the evening (16:00 - 21:00) and close to 1 for the night (21:00 - 7:00) periods. If this ratio is an indicator of relative contribution of diesel- versus gasoline-vehicle emissions, it should presumably drop <1 for the evening rush hour traffic. How do the authors explain this inconsistency? 3. It is difficult to draw general conclusions based on the one-day measurements, as shown in Fig.1. 4. The authors also mention on page 12753, that "benzo(ghi)perylene can be used as a marker of gasoline-powered vehicle activity, as it has the highest emission factor of the 16 priority PAH in light-duty vehicle exhaust but it is not detected in heavy-duty diesel exhaust". First, 16 priority PAH include some gas-phase PAH, such as naphthalene, that has certainly higher emission factor than benzo(ghi)perylene (if properly measured with filters followed by solid adsorbents). Next, although benzo(ghi)perylene is usually not present or present in very low concentrations in diesel vehicle emissions under warm conditions, its concentrations in the emissions from diesel vehicles running in lower temperatures are much higher (Zielinska et al., 2004). This is also true for coronene and indeno[1,2,3-cd]pyrene, the other two higher mw PAH that are usually associated with gasoline vehicle emissions. In general, PAH emissions from diesel-powered vehicles are much more variable than from gasoline-powered vehicles.

Minor comments: 1. Page 12747: why the reference 1 (Dzepina et al.) is placed here and not with other references? 2. Page 12749, line 24: what does Maundy Thursday

ACPD

5, S5105–S5107, 2005

mean?

References:

Fujita, E. M., B. Zielinska, D. Campbell, W. P. Arnott, J. C. Sagebiel, J. C. Chow, L. R. Rinehart, P. et al. (2006). "Variations in Speciated Emissions from Spark-Ignition and Compression-Ignition Motor Vehicles in the California's South Coast Air Basin." Journal of the Air and Waste Management Association, in press. . Zielinska, B., J. Sagebiel, J. D. McDonald, K. Whitney and D. R. Lawson (2004). "Emission rates and comparative chemical composition from selected in-use diesel and gasoline-fueled vehicles." Journal of the Air and Waste Management Association 54(9): 1138-1150

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 12741, 2005.