

Interactive comment on “Comparison of emission ratios from on-road sources using a mobilelaboratory under various driving and operational sampling modes” by et al.

Anonymous Referee #1

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The authors report the results of mobile laboratory-based sampling of on-road motor vehicle emissions in Mexicali (in Mexico near the California border) and Austin, Texas. These results are compared with previous measurements of vehicle emissions from Mexico City made by the same investigators. A strong point of the paper is the use of advanced instrumentation to measure a long list of important pollutants, some of which have not been extensively studied previously.

It would be preferable to report the results as emission factors rather than pollutant ratios to CO₂ as these authors have done. Related recent papers on this topic are reporting emission rates as mg or g of pollutant emitted per kg of fuel burned (see Imhof

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et al ACP 2006; Burgard et al ES&T 2006; Grieshop et al Atmos Environ 2006; Bishop and Stedman ES&T 2008; Ban-Weiss et al Atmos Environ 2008). Reporting in consistent units will facilitate comparisons with other studies. Though the CO contribution to total carbon in exhaust is not large on average, ignoring CO emissions and just using ratios to CO₂ in the emission factor calculation will lead to systematic high bias. This could be especially problematic for the high-emitting gasoline engines that have high CO levels in their exhaust.

The various operational modes of the mobile lab used in this study provide different information about vehicle emissions: fleet-average results, individual vehicle plume snapshots in roadside mode, and information on variability for a single vehicle while operating in chase mode. The sample sizes acquired in the roadside sampling mode do not appear to be large enough to characterize the distributions of emissions – it would require at least several hundred vehicle sample to accomplish that objective.

The point of comparing vehicle emissions among various locations is unclear. Why would one expect Mexico City and Mexicali vehicle emissions to differ? Why is this important to study? (p 8064, line 7-8). The authors wait until much later in the paper (p 8076, line 14) to acknowledge altitude effects on emissions may be an important factor. The altitude of Mexico City should be stated. The reader is left wondering whether (a) the differences between locations are statistically significant, (b) the differences are due to altitude effects, vehicle fleet differences, or other causes. From the data available, it does not seem possible to separate different contributing effects.

Minor/Editorial comments:

Table 2: it is difficult to know what to make of these numbers as the populations and amount of vehicle activity are different in each region. I recommend presenting the emission factors rather than emissions. It seems the fuel use was rather uncertain for Mexicali, so presenting the emission factors rather than tons/day emissions might be more definitive and insightful in terms of comparisons.

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At p 8072, line 1, why are fuel N emissions mentioned in the context of vehicle emissions? The nitrogen content of gasoline and diesel fuel is of negligible importance for NO_x emissions from on-road vehicles.

Repetitive text appears on p 8061 (lines 10-12, lines 14-15), p 8063 (lines 21-22), p 8077 (lines 25-26). The verbatim reuse of the same text should be removed when the paper is revised.

P 8059, there is a typo in affiliation 1: Molina Center for *the* Energy and the Environment

At line 24 on p 8068, the anticorrelation between CO and NO_x is not apparent in Figure 2 as claimed, because of the way the axes were selected in this figure – CO and NO_x emission ratios were not plotted against one another.

At line 26 on p 8069, 56 m/hr should be km/hr

At line 8 on p 8073, a reference is needed for the statement that fuel-based HC emissions increase with high-load engine operation.

At line 9 on p 8081, cited author surnames have spurious "a" following Wang, Chan, Cheung, and Leung.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 8059, 2008.

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