Atmospheric
Chemistry
and Physics
Discussions

Interactive comment on "Emission Factors of Black Carbon and Co-pollutants from Diesel Vehicles in Mexico City" *by* Miguel Zavala et al.

Anonymous Referee #1

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General comments

Description: This discussion paper describes emission factors of diesel-powered trucks and buses in Mexico City measured using both the Aerodyne mobile laboratory and on-road remote sensing. The targeted compounds include CO, NOx, SO2, selected VOCs, PM, black carbon (BC), and particulate organic carbon (OC). The two methods produced similar results. BC emission factors were consistent with those measured in other studies, while the OC/BC ratio was larger than found in California. Emission factors generally agreed with those used in the EPA MOVES-2014b model for NOx and BC and were higher for CO, OC, and selected VOCs.

Relevance: Heavy-duty diesel-powered vehicles are responsible for substantial amounts of BC and NOx emissions, yet there are limited on-road measurements of

emissions from these vehicles. This work adds to the database of such measurements and shows that the chasing method with a mobile lab and the on-road remote sensing method produce comparable results, so it is fair to synthesize results across these different types of studies.

Assessment: The work contributes useful information about emissions from diesel engines. The writing and figures are very clear and informative. The paper illustrates the strengths and weaknesses of each of the two methods for measuring emission factors. The paper could be strengthened through some reorganization of the Results and Discussion and addition of statistical tests.

Specific comments

1. p. 4, line 10: A little more information about the prescribed driving routes and operation of the vehicles would be useful. What was the range of speeds? Were the engines always warmed up beforehand?

2. p. 7, lines 24-26: "Since the measurements were obtained in similar prescribed driving routes, the results show a wide range of average emission factors associated with each vehicle engine and emission control characteristics." The wording and logic are not quite right here. I think the authors intend to emphasize that driving conditions were very similar for all vehicles, so differences must reflect variability between engines and control systems. But later, they assert that there is large variability even for the same vehicle.

3. p. 8, line 7: The comparison of emission factors among different vehicle types begs for statistical tests of differences. This is true for the presentation of differences by control technology, too.

4. p. 8, line 26: The paragraph about the limitations of the sample size should be moved to the Discussion section.

5. p. 9, line 5: The comparison between the two methods in Section 4.1 seems it

belongs more in the Results section than in the Discussion section because it is a straightforward presentation of results that address one of the objectives of the study.

6. p. 9, line 11: For comparison of the two methods, the authors chose to use the 10 seconds of AML data leading up the instant of remote sensing, which lasted 1 second. Why not isolate the 1-2 seconds of AML data that best correspond to when the remote sensing measurement was captured?

7. p. 11, line 15: I assume that all the vehicles tested in this study were running on petroleum diesel, so results for B10 and B20 biodiesel are irrelevant to the present study and do not merit mention here, or they require greater justification for inclusion in the comparison.

8. p. 12, line 10: Can the authors comment on why there are differences in the OC/BC ratio compared to that found in other studies? Might altitude explain some of it or dilution? The mobile lab and remote sensing detect fresher, less diluted plumes compared to tunnel studies.

9. Table 2: This could be moved to the supplemental information, as a more digestible summary of the results appears in the figures. Footnote 4 mentions "hundredths" of Metrobuses. Should this be 101 Metrobuses, the number sampled?

10. Figure 4: The NO figure shows small variability in mobile lab measurements and much larger variability in remote sensing measurements (large spread in the y-axis direction). This does not comport with Fig. 1, which shows similar variability in the NO emission factors measured by both the mobile lab and remote sensing. Is it because these data points are limited to a much shorter period?

Technical corrections

11. p. 4, line 10: The wording "the AML was positioned behind target diesel vehicles" makes it sound like the AML was stationary or attached to the vehicles. I suggest something like, "the AML followed behind target diesel vehicles," instead.

12. p. 5, lines 1-2: Rewrite "we have referred rBC to BC in this manuscript. . .."

13. p. 5, line 2: "detection limit" should be "detection limits".

14. p. 7, line 26: Change "observed" to "reported".