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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Secondary organic aerosol formation from gasoline vehicle emissions in a new mobile environmental reaction chamber" *by* S. M. Platt et al.

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Comments: Primarily regarding scope of study and sample size

This discussion paper effectively describes the design, operation, and testing of a new instrument/technique. These portions of the paper are good. However, there are some issues in the paper regarding the degree to which the initial results of the chamber are extrapolated to address the formation of secondary organic aerosol on much larger scales. In the paper, a sample of 1 motor vehicle is used to make several major conclusions about the emissions and SOA formation of the whole gasoline fleet. These are very interesting initial results, but are limited by their sample size. Otherwise this is

a good instrument paper. My points on this topic are discussed below:

Comparison to diesel vehicles: Side by side tests to diesel vehicles would be much more convincing than a comparison to a different study that may have had significant differences in experimental parameters. Furthermore, in the discussion (p. 28365 line 25) and conclusion (pg. 28367, lines 8-9) sections it is not made clear that the diesel results are from a separate study. The comparison is also complicated by the comparison of vehicles from different generations of regulations (Euro 3 vs. Euro 5), added discussion may be helpful.

Sample size: The magnitude of emissions from motor vehicles has a large amount of variability between different vehicles. No single vehicle is "typical" (p.28362, line 10) and the differences between similar age and model vehicles can vary substantially. So, reporting emission factors as a main result and using them as representative values to base conclusions on regarding atmospheric SOA from all motor vehicles is a bit tenuous. For example, the statement on pg. 28365 (lines 1-2) is overly-extrapolated relative to the scope of the study.

Other comments:

Were the organic aerosol loading effects (shown indirectly in figure 4c as OA + BC) taken into account to get an appropriate SOA yield for comparison to the diesel SOA from the other study? The SOA "EF" shown is not at atmospherically relevant conditions; the partitioning of SOA will be much higher at $\sim$200 ug/m3 (shown in figure) than 1-10 ug/m3 in the atmosphere.

Emission factors shown in figure 4c as the right axis may be confusing for some as they show the EFs changing with age. Emission factors are typically defined at emission and not shown as variable over atmospheric processing. Consider revising.

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