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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Particle and gaseous emissions from individual diesel and CNG buses" *by* Å. M. Hallquist et al.

Anonymous Referee #1

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Johnsson et al. measured particle and NOX emission factors (EF) under conditions of ambient dilution from 35 individual busses taken from the actual bus fleet. Three types of engines were studied, including diesel EURO III-IV busses with and without diesel particle filter, and busses fuelled by compressed natural gas (CNG). Among the findings were the highest observed particle number EF from CNG busses, which however emitted the smallest particles mass compared to diesel busses. Accordingly, the particle mode was much smaller for the CNG busses relative to the diesel fuelled ones. The manuscript is scientifically sound, well written and the results are nicely transparent.

Specific comments Page 2, line 24. This could be further elaborated. Following dilution, semivolatile organic compounds (SVOC) partition from the condensed phase

to the gas phase until equilibrium is achieved. Other secondary particles originating from vehicular emissions are formed during atmospheric oxidation of semivolatile and volatile organic compounds (Robinson et al 2007. Science 315, 1259). Contrary to condensates, these are formed in a time scale from hours to days, i.e. on a regional scale. Page 10, line 13-16: Please clarify this paragraph. For comparable particle mass, a shift from larger to smaller particles would increase the surface area. The smaller particles from CNG busses most probably reflects their chemical composition, e.g. diesel particles with no after-treatment have a soot core within a size range exceeding the 10-25 nm mode observed from the CNG busses. The small particles from CNG busess are expected to coagulate on a short timescale.

Table 2, page 15. Modelled EF for PN is lowest for CNG and highest for diesel busses, whereas the opposite is found in this study. Comment on this reverse relationship.

Table 3, page 16. Comment on the high variation observed for apparently similar vehicles, e.g. busses EURO III(SCR, DPF) #1 and #2 EFs differ by a factor 10 for PN, acc and PN, const, and even more for PM,acc. The same PN EF for EURO III Busses # 3-8 differ by a factor of 400 and 35, respectively. Use specific examples.

A general discussion about variation in emissions factors would be appropriate, also including table 4. How many repetetions were the obtained EF based on, and could you provide standard deviations in the tables. Considering the large variation, please discuss the need for repetitions on different days as well.

Technical corrections Page 12, line 1-3. Rewrite sentence for clarity.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 27737, 2012.