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Discussions

Interactive comment on "Chamber simulation on the formation of secondary organic aerosols (SOA) from diesel vehicle exhaust in China" *by* Wei Deng et al.

Anonymous Referee #1

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This article investigates SOA formation from diesel vehicle exhaust, using a photochemical smog chamber. The authors find that SOA production is substantially higher from diesel exhaust than in previous measurements of gasoline vehicle exhaust, indicating a disproportionately high contribution to SOA from diesel vehicles in China. They further conclude that traditional aromatic precursors account for less than 3% of SOA production, and speculate on other possibilities. This is an interesting study, and the investigation of SOA and POA from diesel vehicle exhaust in the context of air quality in Chinese cities will be an important contribution. I would therefore encourage publication, subject to the authors addressing the following comments.

There is no mention at all in the paper as to how (or indeed if) the exhaust was di-

luted with clean air in the chamber, other than the sentence "Depending on the organic aerosol concentration and particle numbers reached inside the reactor as sensed by the affiliated instruments, the exhaust injection time ranged from 5 to 20 min". From this, I understand that the exhaust was injected into the chamber, until the concentrations reached levels that you thought appropriate. Please clarify how the injection time was decided. Please also quote the final dilution ratios, as without these, the numbers given in section 2.4 and table 2, and any comparison between experiments, are meaningless. Do the emission and production factor calculations in sections 2.5 and 3.1 account for dilution? Is the dilution ratio representative of the dilution of diesel exhaust in an urban environment?

Line 145: "Propene was added to adjust the VOC/NOx ratios to approximately 3:1 ppbC:ppb". What concentration of propene was added? Also, I understand that the ratio 3:1 is considered typical of urban environments, but please say so and include references.

Lines 230-232: This needs to be explained better – what is ω?

Section 3.1: Here you state "The relatively backward diesel engine technology and lack of emission aftertreatment devices like diesel oxidation catalyst (DOC) or diesel particulate filter (DPF) would probably be the reasons for higher EFs of POA for China's diesel vehicles in this study", however the EF(POA) reported by the Chirico and Gordon studies were measured without after-treatment (you are aware of this as you state this in the caption of figure 1), so this could not be the reason. Also why do the other studies see higher EF(BC)? In the EF calculation, you assume the same carbon intensity of fuel as Chrico et al. Could this be different?

Line 279: Can the authors speculate as to why the difference here? Higher POA?

Lines 286-290: Have I understood this correctly: there are far more gasoline vehicles than diesel vehicles in China, yet more diesel is consumed for transportation that gasoline?

Line 316: "the discrepancies between predicted and measured SOA were still huge". By how much? Please quantify.

Table 2, and line 718: Please put the units "$\times 10^6$ molecules cm-3" in the column header.

Figure 3: Please include ticks on the y-axis below 100 nm, to make the position of the mode clearer.

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