

***Interactive comment on* “Downwind evolution of the volatility and mixing state of near-road aerosols near a US interstate highway” by Provat Kumar Saha et al.**

Anonymous Referee #1

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In this study, the authors report composition, volatility and mixing state of traffic-related aerosols measured near a highway, 10 m to 220 m from the road edge. Measurements were conducted under varied environmental conditions including winter and summer campaigns. The investigation is important because vehicle emissions undergo a rapid transformation in ambient air which influences the key properties of combustion emissions with respect to their health and environmental effects. The data provided by this work is valuable and data-analysis is ambitious. Especially, this manuscript offers a high-quality data about the volatility distribution of traffic emissions. The topic is fitting well in the scope of ACP. Revised manuscript is suitable for publication in ACP after following comments are addressed:

- The last paragraph of chapter 3.4 (tracer m/z based factor analysis) should be shortened. Perhaps, this paragraph could be moved to the supplement. Did you use estimation $HOA = 13.4 \times (C57 - 0.1 \times C44)$ (Ng et al., 2011) ? I would recommend using PMF (Ulbrich et al., 2009) instead of tracer-based factor analysis, if possible.

- Figure 8: Figure 8 is quite hard to read and should be improved e.g. by adding summer and winter volatility distributions (Table 1) to Fig. 8b for comparison and clarify figure caption. If bins 2-6 (Table 1) are not applied in this work, please, consider removing these bins from Table 1 (or add marking for these).

- Fig S3: Size distributions of nucleation mode particles look odd. Please, check SMPS data carefully, especially particles smaller than 10 nm.

- Fig S7: AN and AS mass concentrations (calculation) based on a statement that aerosols are neutral. Please, add acidity plot (NH₄ measured vs. NH₄ calculated) to prove that assumption (Supplement) or use model such as Aerosol Inorganic Model II (AIM-II) (Clegg et al., 1998) for acidity calculation. An effective density calculation (Kuwata et al., 2011) of OA is limited to particle components having negligible quantities of additional elements. How traffic emissions components such as black carbon and NO₃ effect on density calculations?

References

Clegg, S. L., Brimblecombe, P., and Wexler, A. S.: A thermodynamical model of the system H-NH₄⁺ -SO₄²⁻-NO₃⁻ -H₂O at tropospheric temperatures, *J. Phys. Chem. A*, 102, 2137–2154, 1998.

Ulbrich, I. M., Canagaratna, M. R., Zhang, Q., Worsnop, D. R., and Jimenez, J. L.: Interpretation of organic components from Positive Matrix Factorization of aerosol mass spectrometric data, *Atmos. Chem. Phys.*, 9, 2891–2918, doi:10.5194/acp-9-2891-2009, 2009.

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