Atmospheric Chemistry and Physics Discussions

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# Comment on acp-2022-828

Anonymous Referee #3

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Referee comment on "Vehicular ammonia emissions: an underappreciated emission source in densely populated areas" by Yifan Wen et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2022-828-RC3, 2023

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This study provides a comprehensive vehicular NH3 emission model with useful insight into spatial and temporal variations of vehicular NH3. The important role of NH3 emissions from vehicles in urban areas with higher population densities is highlighted, which could have important implications for PM2.5 and haze events. Overall the paper is well written and I recommend publication if the comments below can be addressed.

- Section 2.1. Please clarify how the NH3 emission factors were obtained. For gasoline vehicles, was NH3 measured directly or predicted based on correlation with MCE? Further information on sample sizes and whether the data represents a wide range of driving conditions is needed. What are the uncertainties associated with the NH3 emission factors?
- Line 94 - 95 explains that NH3 emission factors of other diesel vehicles were calculated based on the relative fuel consumptions compared with HDDVs. It would be useful to highlight any limitations of this approach. It is also stated that the NH3 emissions varied significantly among tested HDDVs. How did you account for this?
- Many findings e.g. total vehicular NH3 (32.8 kt to 87.1 kt NH3 from 2000-2019), proportions of NH3 in different provinces (e.g. 8.91%) will be affected by the uncertainties in the NH3 emission factors. Provide estimates of uncertainty associated with these statistics.
- Does the compilation of gridded NH3 emission inventories account for any effects of different traffic conditions?
- Figure 1. The authors should refer to the SI, which explains how g/kg EFs have been converted to mg/km. It is useful to explain potential reasons for observed differences. For example, the derivations of mg/km emissions from remote sensing have not been adjusted to account for different driving conditions / fuel consumption, whilst dynamometer measurements may be lower than on-road emissions. Farren 2020 (ES&T) could be useful for mg/km NH3 EFs.
- Section 3.1. The literature suggests NH3 emissions from gasoline vehicles can increase as vehicles deteriorate / vehicle mileage increases. Do the trends consider this effect, which may be particularly important in the future if gasoline car ownership is increasing? It would also be useful to state the proportion of the proposed increase in NH3 from diesel vehicles that can be attributed to HDDVs and therefore how this may

change with implementation of China VI.

- Conclusion. This study provides useful insight into vehicular NH3 emissions. It is recommended that the conclusions address the limitations of this study and how this could be improved in the future to better understand the air quality impacts of vehicular NH3.

Technical corrections:

- Use of informal language e.g. line 41 'What's more', line 154, line 176.
- Line 144: 'The monthly variations compare well'
- Line 168: 'might be probably controlled' - be more specific
- Line 198: 'among various population densities.'
- Line 207: should this be 20,000 person/km2?
- Line 236: 'more severe'
- Line 244: 'Euro 7/VII vehicles comply'