

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2022-828

Anonymous Referee #1

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-RC1>, 2022

General comments

In this work, the authors established a comprehensive vehicular NH₃ emission model and compiled a gridded on-road NH₃ emission inventory with high spatial (3 km × 3 km), and temporal (monthly) resolutions for mainland China using published NH₃ emission factors of motor vehicles and their relevant impact factors. With this high-resolution emission inventory, vehicular NH₃ emissions during the period of 2000-2019 were estimated. The authors showed that vehicular NH₃ emissions could exceed agricultural emissions in the densely populated areas, especially for the extreme populous megacities such as Beijing and Shanghai. Although this conclusion is not unexpected, the paper gives a quantifiable and reliable result, which is valuable for future study. The paper is overall well written. I still have some doubts about the uncertainties of the vehicular NH₃ emission inventory and some minor questions as listed below. I recommend publication after these issues are addressed.

Specific comments

1. Line 100: "Bottom-up estimation of long-term vehicular NH₃ emissions". My major concern here is whether the authors have considered the additional impacts of the enhancement of driving conditions caused by traffic congestion in densely populated areas on vehicular NH₃ emission factors? Or maybe the authors can discuss some uncertainties caused by this factor in the consequent sections of the text. After all, this paper focuses on the importance of NH₃ emissions from motor vehicles in densely populated areas.

2. Line 190: I suggest that the temporal distributions of vehicular NH₃ emissions can be moved to the main text, because this topic is one of the novelties of this study. It would be better if the authors could provide a set of temperature-dependended NH₃ emission factor correction factors for reference.

3. Line 196: If possible, I suggest that the authors could add more discussions on NH₃ emissions from residential sources. According to Figure S7, Beijing and Shanghai also have a relatively high proportion of NH₃ emissions from residential sources. Their emissions in each season are even higher than those from motor vehicles, and their emissions, if not unexpected, should also be mainly concentrated in densely populated areas.

4. Line 219: Due to the lack of measurements of vehicular NH₃ emission factors, NH₃ emission inventory still has large uncertainty on the whole. Especially for diesel vehicles, abnormal urea use and different SCR control strategies will affect its NH₃ emission factor. Therefore, it is suggested that the authors could discuss more on the uncertainty of vehicular NH₃ emission inventory.