

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2022-577

Anonymous Referee #2

Referee comment on "Aggravated air pollution and health burden due to traffic congestion in urban China" by Peng Wang et al., Atmos. Chem. Phys. Discuss.,
<https://doi.org/10.5194/acp-2022-577-RC2>, 2022

General comments:

Authors explore the potential impacts of traffic congestion on urban air quality and the corresponding health risks. This is achieved through the development of improved emission inventories by temporal-allocation of traffic congestion data. The authors utilize traffic data to correct for on-road vehicle emission rates, use the corrected emissions data to drive an air quality model, and explore the potential impacts of traffic congestion on air quality using the model generated fields. The explored concepts are interesting and provide an improved approach towards generating comprehensive emission inventories that can be used as input in air quality models, as well as informing air quality policy design and implementation. While the manuscript is clear and well structured, it can be further improved before publication by considering the following suggestions.

Specific comments:

- Please include a brief description on how (techniques/methods) TomTom estimates travel time and CL (e.g., smartphone apps) and the associated uncertainty.
- Line 104, regarding the statement "..., traffic flows increased with the severity of CL": please note in the text that according to the sigmoid relationship (Eq 1), Q asymptotes to a maximum value as CL increases.
- Line 110, "In general, the vehicle emissions were proportional to the traffic flow": please specify which emissions were proportional to traffic flow, the ones you looked at (the 2020 period) or the ones considered by Gong et al. (2017)?
- Section 2.2: what were the model horizontal, vertical and temporal resolutions for CMAQ and WRF simulations. What are the potential impacts of model resolution on your results and how are your chosen resolutions justified for this study?
- Section 3.4: how about uncertainties in TomTom congestion level data?
- Taking vehicle speed into account to correct for estimated emission rates is a step in the right direction and as you have shown has important implications for accurately forecasting urban air quality levels. Considering other relevant processes, it has been shown that Vehicle Induced Turbulence (VIT) can impact pollutant dispersion/transport in the atmosphere and it is advantages to take VIT into account for sub-grid diffusion

parameterizations in air quality models (e.g., Makar *et al.*, 2021). Please comment on whether this has been accounted for in your CMAQ simulations - also what implications can VIT have for your results.

Makar, P. A., Stroud, C., Akingunola, A., Zhang, J., Ren, S., Cheung, P., and Zheng, Q.: Vehicle-induced turbulence and atmospheric pollution, *Atmos. Chem. Phys.*, 21, 12291–12316, <https://doi.org/10.5194/acp-21-12291-2021>, 2021.

Technical corrections:

- Graphic abstract: figure sizes and figure font sizes (e.g., title, legends, labels, tick labels) can be increased to improve readability. (a) needs to be removed from the Mortality figure (bottom-right).
- Please add label (with units) to Figure S1b color-bar
- Line 117: revise "... vehicles were more polluted" to "... vehicles were more polluting"
- Line 199 and 200: consider revising "As a result, the workday rush hours are selected as 07:00-10:00 am and 4:00-7:00 pm, 10:00-11:00 am, and 14:00-19:00 on weekends".
- Line 219: consider revising "..., where have higher vehicle numbers and population density".
- Please consider also including BASE-WE on Figure 3 and Figures S9 to S12.