

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2021-642

Anonymous Referee #2

Referee comment on "A new method for inferring city emissions and lifetimes of nitrogen oxides from high-resolution nitrogen dioxide observations: a model study" by Fei Liu et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-642-RC2>, 2021

This paper describes an improved method for estimating emissions from NO₂ columns. The method is applied to model results so that it can be evaluated thoroughly, with a view to application to satellite data in the future.

The paper is interesting and well written, and the subject is significant. I am happy to recommend publication.

My main comment is that the method is presented as being "new" but is really an evolution of prior work. This is not a problem, but I think the presentation would be greatly helped by describing more clearly what the method was before, and what the change is. I know that the details are already in the manuscript, but at the moment it is a little difficult to follow and to figure out what the significant changes are.

Given that the paper is a methods paper, it would help if the figures and description were more pedagogical in nature. They could show more clearly what the method does and how. This would help the reader follow the explanation.

The study uses 26 cities but does not show much about the difference between them – we barely see where these cities are. Some more details should be presented, at least in the SI if not in the main text.

I think it would be informative to say what percentage of the days are in each wind direction sector. It would also be interesting to see some of the rejected sectors – for someone wanting to replicate the study, it would be helpful to see what was kept and what was rejected. The text could briefly explain the rationale for the decision.

I thought Fig 5 was an odd choice to include in the manuscript. It seems like typical SI stuff (if that even). Maybe moving it would free up some space to include more figures describing the method and the results themselves.

Nomenclature was sometimes a bit clumsy. "ratio" and "emiss'" could have better names for clarity and legibility.