

Atmos. Chem. Phys. Discuss., referee comment RC1  
<https://doi.org/10.5194/acp-2020-1308-RC1>, 2021  
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## Comment on acp-2020-1308

Anonymous Referee #1

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Referee comment on "Downscaling system for modeling of atmospheric composition on regional, urban and street scales" by Roman Nuterman et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2020-1308-RC1>, 2021

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### General comments:

This paper conducts downscale modeling for the Europe-Denmark-Copenhagen domain by coupling HIRLAM, CAMx and M2UE models. Based on two urban monitoring stations, the authors illustrate that the HIRLAM-CAMx system captured well the diurnal cycle of NO<sub>x</sub> and O<sub>3</sub>. During September 4 to 5, 2011, the street level NO<sub>x</sub> pollution (mainly from road traffic) was 2-fold higher on weekend and more than 5 times higher during working day with high pollution episode.

Overall, the downscaling modelling study is quite interesting. However, with the lack of data and figures of both observation and simulation results, the accuracy of this downscaling modeling system needs to be further verified. In addition, several parts of the manuscript should be improved before it can be considered for publication. Specific comments are listed below.

### Specific comments:

- Line 128. In the M2UE simulation, is the 500 m horizontal extent sufficient to represent the atmospheric environment of the street? I wonder if the airflow around the monitoring site is still substantially influenced by the boundary conditions. The extent of the airflow around the street that is largely affected by boundaries needs to be further investigated.
- Line 122. What chemical components and their reactions are included in the M2UE?

- Are the emission data used in the M2UE simulation equal to the emissions in the corresponding grids in the CMAx simulation? If not, how the difference between the emission data affects the simulation results?
- Line 150. Are the inlet or outlet properties of each boundary fixed in the 48 h simulations? How many grids in HIRLAM-S03 and CMAx-04 are chosen to drive the M2UE model? Are the inlet/outlet properties derived from these coarse grids consistent with each other?
- Line 175. Why do the authors select 2011 as the study period?
- Figure 4. Why only the NO<sub>x</sub> concentration is validated in the M2UE simulation? More chemical species are suggested to be evaluated against observations.
- For the M2UE modeling, simulation output is analyzed at only one site. Since the results of a single grid may not be enough to support the conclusion, it is recommended to add more analysis on the horizontal and vertical planes.
- Line 222 and Figure 4. Time-series data/figures of traffic volumes, emissions and boundary conditions are suggested to be provided. Do these data also show two peaks at 31 and 34 h? If so, the interesting difference between the observed concentrations and emissions may need to be discussed.
- Line 246. Typo "/Pearson".
- Line 247. Typo "domians/".
- Typos: "μg" instead of "ug".