

***Interactive comment on* “The impact of urban land-surface on extreme air pollution over central Europe” *by* Peter Huszar et al.**

Anonymous Referee #3

Received and published: 15 August 2020

This paper presents an analysis of the impact of representing the urban canopy in chemistry-climate or air quality simulations. A regional climate and a weather model are used, along with 2 chemistry configurations of those models. In addition, multiple horizontal resolutions are simulated. The results illustrate the value of including a representation of urban canopy in air quality and climate models so as to more accurately simulate air pollution extremes. I find the paper generally acceptable for publication, but have a few recommendations for improvements.

I feel a bit more discussion of the role of chemistry in controlling the NO_x and O₃ (and PM_{2.5}) concentrations would be appropriate. Two different chemistry and aerosol schemes are used; a discussion of how they differ, and showing results that clearly illustrate if they give similar or different results would be interesting. Also, ozone forma-

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tion is affected by temperature, solar radiation (cloud cover); how do the meteorology changes caused by the urban canopy affect the chemistry?

A section on the observations used to evaluate the model is needed. What is the accuracy of the observations? Where are they located?

A description of how PM_{2.5} was determined from the model results is needed.

The line plots showing all the numerous model results are very difficult to read. It would be helpful to have separate plots to illustrate specific differences, such as 1 set of plots to show the difference in resolution for one model, and another set of plots to show multiple models at 1 resolution. Or find some other way to illustrate those model differences (e.g., biases, bar charts of mean bias, correlations, etc.).

I found the Discussion section a bit difficult to read. It would be helpful if the figures more clearly illustrated the points discussed in this section and were referred to at appropriate points. It would also be helpful to have subsections in the Discussion, perhaps separating the findings related to the urban vs no-urban simulations, differences due to model resolution, differences due to chemistry, for example.

Minor/Technical comments

I. 16 (and elsewhere): 5% percentiles is usually written 5th percentile.

I. 124-127: define TUV and MEGAN acronyms

I. 187: "Chemical boundary conditions for the outer domains were taken from the CAM-chem data (Lamarque et al., 2012)." Be more specific about where the boundary conditions come from. I do not know of any archived results from the Lamarque et al. 2012 paper. If they are from the results provided by NCAR they should be referenced as described on: <https://wiki.ucar.edu/display/camchem/CESM2.1%3ACAM-chem+as+Boundary+Conditions> If you ran your own simulations, the details of that should be given.

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I.204: perhaps more details of how MEGAN was run could be included - which vegetation map, which meteorology data, or is MEGAN online in the model?

I. 487: "large taen" -> larger than?

I. 562-4: I don't follow this statement. Should "decreasing" be "increasing"?

Additional proof-reading is needed. There are a number of grammar errors and typos.

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2020-399>, 2020.

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