Atmospheric Chemistry and Physics Discussions

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Comment on acp-2022-337

Anonymous Referee #2

Referee comment on "Impact of urbanization on gas-phase pollutant concentrations: a regional-scale, model-based analysis of the contributing factors" by Peter Huszar et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2022-337-RC2, 2022

The manuscript presents component analysis of the impact of urban areas on air quality in Euorpean cities using several scenario simulations in a regional offline-coupled model system. The manuscript is well written and easy to understand. However there are some issues to be addressed, including the flow and the structure of the manusciprt that can be found below.

Comments:

Section 2.2.

Are fire emissions not taken into account? They can be important episodically for the O3 levels.

A comparison of the two CAMx versions can be provided in the supplement as difference in the chemical mechanism can have significant impacts on the pollutants considered in the

present study? Similar results could point the emissions however different results point both emissions and chemistry. I see this has been discussed in the last section but I think it should also take place, at least partly, here as it now stands detached from each other.

Section 3.1

The plots in Figure 2 are representing cities in the different domains or are they all from the 9 km mother domains? What is the driving meteorology in these plots, WRF or RegCM? Is there a comparison available for the meteorology and associated chemistry over the 9 km grid?

Section 3.2

Does Figure 3 provide the ensemble from both the WRF and RegCM simulations? Please explain and modify the caption accordingly.

Section 3.3.4

Can you please a bit more the case for Milan as it really stands out?

Can you also elaborate a bit on the impact of resolution on these results focusing on the Prague experiment? How much your conclusions would change based on this experiment if you were able to run all the cities on 1 km resolution for example? I am aware this cannot be answered quantitatively without the simulations, but I would like to see a discussion on this.

Section 3.4 focuses on explaining the diurnal variations but do not discuss much the underlying reasons for these diurnal variabilities. I would expect such a discussion supported with some plots, likely in the supplement. I see these decoupled explanations also in other parts of the manuscript. There is of course not a correct way to provide this information but I think the manuscript would benefit very much if the discussions in the last section could be moved to the corresponding sections explaining the impacts of the different scenarios.