Geoscientific Model Development Discussions

Geosci. Model Dev. Discuss., referee comment RC1
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Comment on gmd-2022-145

Anonymous Referee #1

Referee comment on "Evaluation of high-resolution predictions of fine particulate matter and its composition in an urban area using PMCAMx-v2.0" by Brian T. Dinkelacker et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2022-145-RC1, 2022

This manuscript presents an application of the CTM PMCAMx-v2.0 at increasing resolutions of 36 x 36, 12 x 12, 4 x 4, and 1 x 1 km for a domain covering Allegheny County and the city of Pittsburgh in southwestern Pennsylvania, USA to predict PM2.5 and its components. In general, the paper is very well structured and written, supported by relevant past works. The results are adequately presented, and extensively analysed covering the assessment of model performance for PM2.5 and its components, the influence of different horizontal resolutions and of the improvement of emissions allocation for cooking and traffic.

However, I have two main concerns regarding the presented work:

- The analysis presented and discussed is based on a modelling run for only two months – February and July – and the discussion and conclusions are drawn for Winter and Summer periods. An example is the sentence in line 327 "Total PM2.5 mass concentrations are underpredicted in the summer period". It is clear that those months were chosen due to the availability of measurements, particularly PM2.5 compounds. Notwithstanding, the study would be much more robust and conclusion better supported if the modelling period was at least one year. Results could be assessed with the observations from fixed monitoring sites for the whole year, with a focus on those two months for which more data is available.
- The authors refer that "Garcia Rivera et al. (2022) investigated the effects of increasing grid resolution of model inputs and CTM output on source resolved predictions of PM2.5 concentration and population exposure at 36 km, 12 km, 4 km, and 1 km". Is the current work based on the simulations performed by Garcia Rivera et al. (2022) or are there additional runs in the present work? Are the runs referred in lines 309 – 310 examples of additional simulations? What exactly is the novelty of this study compared to (Garcia Rivera et al.,2022)? This should be made clear in the manuscript and perhaps the "Model Application" section could be shortened since it is already explained in the published paper.

Specific comments

- The abstract is too long and has many details of the analysis of results that are unnecessary in an abstract. Conversely, the Conclusions lack a more comprehensive and focused text on the added value and limitations of this work and concrete ideas for future work.
- Section 3 has a subsection 3.1, that would only make sense if a 3.2 exists. Please restructure this section or remove the subsection title. One idea is to join sections 2 and 3 into one section.
- Figure 1 – Please include the metric scale, and draw the inner domain to allow to have an idea of where stations are located in relation to the modelling domains.

Technical corrections

- Line 323 - The reference (Kodros et al., 2021) is missing in the reference list.
- References Day et al., 2015, Skyllakou et al., 2021, included in the reference list are not cited in the text.