

Editor comments: MS acp-2020-1087

Thank you for addressing most of the reviewer comments. However, I think, while your response to the reviewer comments was quite extensive, several of the responses could also be implemented better in the text as they might be also of interest to the readers of your paper. In addition, I have some further technical/minor comments that should be addressed.

In responding to my comments, please list them in a single document together with your responses, the line numbers of the revised manuscript with the changes and the marked-up manuscript.

I. Referee & Editor comments

1) Reviewer #2 comment: Finally, some discussion about the impact of the Street-in-Grid at the regional scale downwind the city is missing. It is clear that the two-way coupling will improve the skills of SinG at the regional scale if it is evaluated with urban sites, but does this result also in an improvement of the mesoscale model photochemistry downwind Paris? Is there any sensitivity in NO_x and other reactive gases like O₃ in some rural areas affected by the pollution plume of Paris?

Author Response: O₃ background concentrations obtained with SinG are in average 5.90% larger than those obtained by Polair3D, with a maximal value of 20%. These relative differences of O₃ concentrations have a similar spatial distribution as observed in Figure B2 (right panel), limited mainly inside Paris city. No considerable differences are observed outside the street-network.

Editor comment: Please add some information to the text that describes the small differences on the downwind side of Paris

2) Reviewer #1 comment: The authors should justify why only a relatively short period (1-28 May, 2014) is used for model validation.

Author Response: This paper aims at analyzing the influence of the non-stationary regime and multi-scale coupling at both local and regional scales. Many runs were performed for this sensitivity study, and a one-month simulation period is long enough to analyze the processes.

Editor comment: This information should be added at the beginning of Section 5.

Author Response: There is a mismatch between the year of emissions over Île-de-France of the domain 3 and over the domain 4 that is from 2012 and the model validation period of 2014. Explain how this may influence comparison of model results and measurements.

3) Reviewer #1 comment: As specified in the paper, 2012 Airparif inventory is used only for sectors different than road traffic. Traffic emissions use data specific of 2013 and 2014. Comparisons between the 2012 Airparif inventory and the more recent 2015 Airparif inventory show that the most important differences in NO_x emissions between the two years are due to differences in traffic emissions. Because traffic emissions are specific of the year studied here, we do not think that using the 2012 inventory for sources other than traffic impact our comparison of model results to measurements.

Editor comment: Please add also this information to the paper.

4) Reviewer #2: Figure and Table captions: all captions should be self-explanatory. Several Tables and Figures present information that is not described in the caption (i.e., name of variables, units, the meaning of acronyms or abbreviations.)

Editor comment: While I appreciate that you added units etc to the figure captions where appropriate, some of the captions and figures should be improved:

Figure 1:

- 1) This caption needs more information: Add the models you used, and details on the simulation
- 2) Add a scale, either in latitude/longitude or km to the figures.

Figure 2, caption: This caption is not self-explanatory. Please add more details on which simulations, models etc so that the reader understands what information for which reason

Figure 3:

- 1) This caption needs more information: Add the models you used, and details on the simulation
- 2) Add a scale, either in latitude/longitude or km to the figure.

Figure 15, caption: Add details on the simulation

Figure 16: Improve the figure legend and clarify, either in the legend or caption, 'inflow, emis, vert, outflow'. Refer to Eq.-18 in the caption.

Table 3, caption: Add more information and define the abbreviated words

Tables 4 and 5, caption:

- Not all readers might be familiar with all of the abbreviated statistical parameters. Define them in the caption (or in footnotes).
- Add enough information that the reader can understand what simulations and assumptions these numbers refer to.
- Instead of 'statistics', it should rather read 'statistical parameter' or 'statistical measures' or similar.

II. Technical/minor editor comments:

Line numbers refer to uploaded revised manuscript without annotations

I. 128, here and in the remainder of the manuscript: There is no need to repeat the definition of MUNICH

I. 135: replace 'model' by 'models'

I. 170: This reads as if you were referring to two different equations but they seem to be the same. I suggest writing: 'According to Eq.8. ...'
and then at Eqs.8 and 9, you add the reference to Kim et al. 2018.

I. 183: replace 'which are calculated' by 'which is calculated' – unless you also calculated the value of beta, when then deserves an extra sentence.

I. 262: Please make sure that you include the full name of the website. Currently it seems truncated and the link is not thus not working

I. 334: What are these 'performance criteria'? Are they defined somewhere? If so, please refer to the respective section; if not, add their definition.

Table 7, caption: Replace 'correspondent' by 'corresponding'

I. 444: 'concentrations' misspelled