Atmospheric
Chemistry
and Physics
Discussions

Interactive comment on "Street-in-Grid modeling of gas-phase pollutants in Paris city" by Lya Lugon et al.

Lya Lugon et al.

lya.lugon@enpc.fr

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Anonymous Referee #1 General comments

The objective of the paper is to quantify the effect of a dynamic multi-scale model-ing between the regional and local scales on NO, NO2 and NOx concentrations over the street network of Paris city. This is done using a recently developed multi-scale model system named Street-in-Grid (SinG) that estimates gaseous pollutant concen-trations simultaneously at local and regional scales, coupling them dynamically thereby addressing the question of double counting of emissions. This coupling combines the regional-scale chemistry-transport model Polair3D and the street network model MUNICH (Model of Urban Network of Intersecting Canyons and Highway). A new

non-stationary approach is implemented for pollutant dispersion in streets with a fine coupling between transport and chemistry to improve prediction of the reactive pollu-tants of NO2 or NO. The analysis covers a number of aspects (a) stationary versus non-stationary approach for different time steps, (b) model validation by comparing simulated and observed concentrations at both traffic and urban background stations of Paris city (c) the influence of the dynamic coupling between the regional and local scales. The paper demonstrates improvements in model predictions when using the non-stationary approach and dynamic coupling approach based on model validation as well as analysis of model elements and inputs. Both approaches are novel compared to existing multi-scale model systems, and the paper provides a substantial contribu-tion to scientific progress. The paper is based on solid scientific methods. The paper is very detailed in the analysis and subsequently relatively long. The presentation is clear and the paper is well written and well structured. The conclusion is supported by the data presented, analysis and discussion.

Specific commentsÂă:

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

Reply: 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.

- 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.

Reply: As specified in the paper, 2012 Airparif inventory is used only for sectors differ-ent than road traffic. Traffic emissions use data specific of 2013 and 2014. Compar-isons between the 2012 Airparif inventory and the more recent 2015 Airparif inventory

show that the most important differences in NOx 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.

- Remove line 481-482 in the conclusion as the conclusion should not state future research endeavours. Reply: These lines are removed.

Technical corrections

- Line 101 "DEOM" should be "DEHM" and "Operational" should be "Hemispheric". Done - Consider to use a finer colour scale with more categories in Figure 4. Done. - Line 265 "The most important emissions" should be "The highest emissions". Done - Figure 6, stations names should be larger to ease reading. Done. - To ease the reading of Table 6 two columns could be added that indicate which traffic stations have high traffic emissions and which are adjacent to big squares. Done.