Atmos. Chem. Phys. Discuss., 15, C3608–C3611, 2015
www.atmos-chem-phys-discuss.net/15/C3608/2015/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Impact of vehicular emissions on the formation of fine particles in the Sao Paulo Metropolitan Area: a numerical study with the WRF-Chem model" *by* A. Vara-Vela et al.

Anonymous Referee #2

Received and published: 15 June 2015

Reviewer comments on " Impact of vehicular emissions on the formation of fine particles in the Sao Paulo Metropolitan Area: A numerical study with the WRF-Chem model" The manuscript presents a modeling study investigating the contribution of vehicular emissions on the air quality levels over the San Paulo Metropolitan Area. The study employs a number of scenarios in order to validate the model results as well as quantifying the contribution of vehicular gas and particulate emissions on the air quality levels on O3 photochemistry. There are a number of issues to be clarified and further described and discussed that I list below before it can be published in ACP. Among all, I think it is necessary to have a base case simulation where all emissions sources

are included to be more conclusive on the contribution of traffic emissions to air quality levels. It may be true that urban emissions are generally dominated by traffic emissions, however as the authors also discuss, traffic does not explain 100% of the total anthropogenic emissions. The English language also needs to be revised.

Comments:

1) The introduction should be extended with more background in general regarding traffic and its impacts on aerosol levels and the radiative impacts of the aerosols on photochemistry. The motivation and the aim of the study should be more clear and can be organized in a paragraph rather than scattering throughout the introduction section.

2) Omission of anthropogenic emissions other than the traffic sources should be mentioned clear in the Emissions section. Additionally, the anthropogenic emissions used in the coarser domains should be described clearly.

3) As the on-road vehicular emissions are emitting on the surface, a vertical distribution is not necessary. However, the authors should explain if they have used any vertical distribution for the emissions in the coarser domains. The impact of these missing sources on the model results and related discussions on the impact of traffic on air quality levels should be discussed.

4) What are the spatial and temporal resolutions of the boundary conditions?

5) The HYSPLIT configuration should be described in the methodology section with a reference to the model.

6) Section 3.1: While it is true that the behavior of the main meteorological systems should be analyzed in order to understand the spatial and temporal variability of aerosols, the authors lack to discuss how these conditions would affect the levels. As the measurements would have a temporal variability, the authors could compare the measurements with the meteorology to show how meteorology (e.g. precipitation) can influence aerosol levels.

7) Section 3.2: Page 14, line 28: As the WRF model calculates wind speeds and PBL height, it would be straightforward to show if low PBL heights or wind speeds caused the high levels of PM.

8) As the statistics are made for all the sites, can the authors also comment on how the model performance differs among individual stations? For example correlation coefficients and Normalized mean biases (NMB) can be shown for each station in Figures 7-9.

9) Section 3.3: It would be good to see more discussion on Figure 15 as I think it is an important figure showing the size distribution capability of the model for the different aerosol species. For instance, while the model underestimates SO4, it over estimates NO3 and NH4, meaning that the model simulates more NH4NO3 aerosols compared to (NH4)2SO4 aerosols. Correlation coefficients of observed and simulated NH4 and SO4 levels can give important information on why the model behaves as such (see for example Im et al., AtmEnv, 2012 and references therein).

References

Im U., Markakis K., Kocak M., Gerasopoulos E., Daskalakis N., Mihalopoulos N., Poupkou A., Kindap T., Unal A., Kanakidou M., 2012. Summertime aerosol chemical composition in the Eastern Mediterranean and its sensitivity to temperature. Atmospheric Environment, 50, 164-173. Technical corrections:

Abstract:

Line 9: Remove “during a month,”

Lines 21-27: I would move this part to line 9, before the sentence starting with “The study period. . .”

Introduction:

Page 5, Line 16: Add a reference for the increase in PM2.5 and O3.

Section 2.1:

More detail (urban/traffic/background etc. . .) is needed for the characterization of the sampling site in the NUANCE_SPS project.

Section 3.1:

Page 13, line 4: Change “lesser” to “lower”.

Page 13, line 8: Change “comes” to “coming”.

Section 3.2:

The figure caption of Figure 4 should be more explanatory.

The figure caption of Figure 10 should be more explanatory, showing that these statistics are for the individual 11 stations for example

The figure caption of Figure 11-13 should explain what red dots and cyan numbers are although they are described in the text. This comment goes for all relevant figures in the manuscript.

Section 3.5:

Page 20, line 2: Change to “. . .and measurements at IAG-USP shown in Figure 14 include the Case_1 simulation.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 14171, 2015.