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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Experimental and model assessment of $PM_{2.5}$ and BC emissions and concentrations in a Brazilian city – the Curitiba case study" *by* Lars Gidhagen et al.

Anonymous Referee #2

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General comments The article presents important results regarding campaigns of measures in the scope of the ParCur project. The observational part was made based on measures close to the surface, in fixed and "mobile" stations (bicycles), and at the level of 70 m above the ground. This is the richest and most important part of the article. Also, three different models were applied to try to represent the concentrations of Black Carbon, Particulate Material 2.5 and Oxides of Nitrogen. Despite three different approaches to modeling, little useful information has been obtained, making several approaches, both in terms of emissions and in terms of the results obtained, and is therefore the weak part of the article. The general recommendation is to keep only the observational part of the work, with the modeling part being excluded. Here are some

specific points that led to this conclusion.

Specific comments

Page 2, line 19: correct the units "μg m$-$3"

Page 2, line 29: Is the year of the reference correct? In the reference list it appears as 2014

Page 3, lines 17 – 20. The authors said that "As far as we know, this is a pioneering study in South America with the integration of fixed and mobile high spatio-temporal resolution PM2.5 and BC measurements, the development of emission inventories and the implementation of modeling tools at different spatial scales for validating the emissions and to determine the spatial distribution of pollutant concentrations across the city." Maybe you are referring to studies about Black Carbon over Curitiba, but, in fact, there are at least a dozen of studies combining high resolution measurements with well stablished modeling tools in São Paulo and Rio de Janeiro (see the works by Professors Paulo Artaxo, Maria Andrade, Luiz Pimentel, and others). There are at least 30 years of air pollution studies in Brazil and a "long road" of knowledge was built. This need to be valued. Your emission inventory does not consider many important features of the Brazilian fleet (content of ethanol in the gasoline, vehicular fleet aging, secondary roads, among others). You are applying different models that do not interact with each other. Your modeling results are far away from the observed concentrations. So, it is exaggerating to consider it as a pioneer study.

Page 5, lines 18-19. The authors said that "Emission factors for bi-articulated buses were extrapolated using information on fuel consumption provided by the Curitiba municipality". Please, clarify how was it possible to separate fuel consumption from one type of bus to another? Are bi-articulated buses using an exclusive type of diesel that allows that estimation? Page 5, lines 20-21. The authors said that "The use of biofuel lowers the PM and BC emissions by 50%, according to the U.S. Department of Energy (2018)". What is the relevance of this information for this study? Was this reduction

considered in your emissions? This is not clear.

Page 5, 30 – 34. What was the procedure to adjust EEA emission factors to the Brazilian reality? There is a recent work from Ibarra-Espinosa et al (2018) that could be consider in your work, since it applies very detailed procedure on building an emission inventory adjusted to the Brazilian conditions. (Ibarra-Espinosa, S., Ynoue, R., O'Sullivan, S., Pebesma, E., Andrade, M. D. F., and Osses, M.: VEIN v0.2.2: an R package for bottom–up vehicular emissions inventories, Geosci. Model Dev., 11, 2209-2229, https://doi.org/10.5194/gmd-11-2209-2018, 2018.)

Page 7, line 5. Actually, 10 x 10 km2 or 50 x 50 km2 refers to grid spacing, not resolution. The minimum resolution for these grids would be equivalent to 20 and 100 km2 (2 x delta x,y). The lowest grid spacing probably will represent the urban area of Curitiba by one or two grid points. In that situation, emissions will be poorly represented. Please comment on that matter.

Page 7, line 24. Please, comment on the constraints regarding the use of neutral stability in your simulations with OSPM.

Page 9, lines 3-9. The explanation for high BC concentrations during the weekends of 6-7 and 13-14 August is not clear. If the wind speed and emissions are low, how to explain the high levels of BC if you are ruling out this contributions?

Pages 9 and 10, section 3.3 and 3.4. These sections are very poorly explored. The authors give an impression of a very simple process to simulate. Results of the simulations are not in good agreement with the observed concentrations and the authors use linear correction rates to adjust the concentrations, instead of exploring the errors on their emissions. The processes involved are not linear. There are reactions involved that will be dependent on concentrations and environmental conditions. See for example the procedure described between lines 17 and 21.

Pages 13 and 14. As pointed out by the authors, many features were not included in

order to represent correctly the emissions of BC, PM2.5 and NOx. There are many arguments, but little basis for a correct guidance on procedures to be adopted for better public policies aimed at improving air quality. The observational part is rich, but the application of numerical models does not add important or useful information. Thus, the greatest recommendation regarding the article is that the observational part be used, but that the modeling part be withdrawn, since it gives the impression that the problem of air quality is of simple treatment, making adjustments here or there, neglecting important physical/chemical processes and replacing them with mere statistical procedures.

About the References

Missing references The references "World Medical Association, 2014" and "Zhang et al., 2015" are missing in the reference list.

Reference list The reference "Targino, A. C., Gibson, M. D., Krecl, P., Costa Rodrigues, M. V., dos Santos, M. M., & de Paula Corrêa, M. (2016). Hotspots of black carbon and PM2.5 in an urban area and relationships to traffic characteristics. Environmental Pollution, 218, 475-486. https://doi.org/10.1016/j.envpol.2016.07.027 ", was not cited in the text. Change the order of the references Wallace et al, 2011, and VISSIM, 2018.

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