Geoscientific

Model Development

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Discussions

[GMDD]

Interactive

comment

Interactive comment on "EXPLUME v1.0: a model for personal exposures to ambient O_3 and $PM_{2.5}$" *by* Myrto Valari et al.

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Received and published: 7 January 2020

On behalf of all authors I would like to thank the reviewer for his/her interesting comments and suggestions. We addressed all the concerns raised. Please find below our detailed report with all actions undertaken to improve the manuscript accordingly. The number of lines correspond to the annotated manuscript with all changes with regards to the GMDD submission tracked. The report is also attached as separate file (supplement pdf).

AC = Author comment

GENERAL COMMENT

1. You would need in my opinion to careful explain the implication of these assump-

tions, and how these affect (or not) the robustness of your results.

AC : We address this issue carefully throughout the text (see our response to the reviewer's specific comments)

SPECIFIC COMMENTS

1. pag 6 row 150-155. The authors speak about 'adjustment' of the concentrations, without specifying what they are doing, and the implications in terms of results' sensitivity.

AC : This issue has been also raised by the 1st reviewer (see our detailed response in the Specific Comment # 3.5.

2. pag 8 row 190-195. Assumptions on dwelling are proposed (25% vs 75%) without explaining why and which are the implications of this choice

AC : This choice is based on statistical data derived fro the INSEE (2014) tables. This is said now more clearly in lines 228-230.

3. Table 2: how the modelling results change modifying these parameters? Are these parameters robust?

AC : The choice of the parameters presented in Table 2 is based on data from various official sources already given in the paper (lines 221-225) such as INSEE (2014) and ADEME (2013) and OQAI (2006). The sensitivity of the model output to these parameters had been indeed studied through sensitivity analysis. This preliminary work was not mentioned in the paper. We add some information in lines 225 - 230.

4. pag 11 row 220-225. "we assume that if the itinerary of an individual intersects...': also here I am not able to evaluate the impact of this assumption. The authors should in my opinion clarify the impact of all these assumptions.

AC : Several measurement campaigns have shown that PM2.5 concentrations inside road tunnels are several times higher than on the road outside the tunnel. Here we

used data from the AIRPARIF (2009) study to derive a coefficient to account for the increased exposure inside the tunnels. The model resolution is too coarse to resolve the road network and therefore explicitly account for the fact that a given trajectory intersects a road-tunnel. For this reason we assign a probability for this to happen. At this stage of development of the EXPLUME model we assign an arbitrary probability of 0.2. This number seems reasonable given the area of the model grid-cells and a typical length of a road tunnel in the Paris area. To be more accurate we need to analyse road traffic data. This is an interesting suggestion for future improvement of the EXPLUME model. We now explain this in lines 267-270.

5. Another point. Now I already read lot of papers in which population activities are derived using GPS (mobile phone i.e.) data. This is a more direct approach to 'individual exposure' as it allows to get the mobility of the people (at least a proxy) with a reduced number of assumptions. You should at least explore this option in the paper, and explain pros and cons of your approach in comparison to a 'GPS data' based approach.

AC : We would like to thank the reviewer for pointing to this omission. We now add a discussion on the challenges of using data from smart phones with built-in GPS in personal exposure assessment. We also explain how a combination of questionnaires-based data (activities and transportation modes) with trajectories derived from analysed GPS data would help assessing large part of the uncertainties related to the time-activity data in exposure science (lines 395-400).

6. I would like (pag 6 row 144) a bit more on the CHIMERE validation. Now it is difficult for me to judge if the model is working properly on the selected domain. Also in view of the 'adjustment' that the authors have to do (see my previous comment).

AC : The section of CHIMERE model validation (Section 3.1) has been significantly changed to assess the specific comments 3.1 to 3.6 of the 1st reviewer. We are confident that the new version provides enough information to judge the CHIMERE model performance over the study domain and the simulation period.

7. In the introduction it seems that the authors are claiming that PM2.5 and O3 impacts on health are comparable. While in reality PM2.5 impact is much higher on population, than the O3 one. Please try to be more accurate here, quantifying these impacts (as from EEA report on Air Quality Status 2019, i.e.).

AC : The epi studies in the Introduction have been updated in this revised version of the manuscript. The effects of ozone and PM2.5 are now addressed separately to highlight that the health impact of PM2.5 is higher (lines 20-27).

Please also note the supplement to this comment:
https://www.geosci-model-dev-discuss.net/gmd-2019-259/gmd-2019-259-AC2-supplement.pdf

Interactive comment on Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2019-259, 2019.