

Interactive comment on “Prediction of source contributions to surface PM₁₀ concentrations in European cities: a case study for an episode in December 2016 using EMEP/MSC-W rv4.15 – Part.2 The local urban background contribution” by Matthieu Pommier

Anonymous Referee #3

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For editor The author changed the definition of “Local” from country to city and produced another paper. There is nothing innovative in the current study but giving some valuable information that PM10 in most cities in Europe is mainly attributed to the area in domestic country in addition to the city. In addition, the author can provide information like “the contribution of “local”, “domestic country in rest of Europe”, “other countries in rest of Europe”, and “Extra”, in terms of each city. Therefore, the reviewer think it is worth to be read widely. However, there are some points the reviewer cares,

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e.g., why the author used forecast meteorology instead of retrospective? the method of nonlinearity calculation, etc. Therefore, the reviewer suggests the outcome of this review is “major revision”. The reviewer is willing to review the revised manuscript for the next submission.

For authors General comments: The reviewer used to think that the chemical non-linearity is the chemical reaction between sources. In this study, the authors used the ratio of standard deviation of hourly concentration to hourly concentration. What is the principle or base for their method? Why the nonlinearity is calculated based on statistics instead of chemistry? In addition, the authors cited Pommier et al. (2000) a lot. It is ok to cite a companion paper but the reader is not obligated to read the companion paper. Therefore, some information should be explained or mentioned in the current manuscript. At last, the reviewer thinks although the current study is not innovative compared with the Part I study but still provide a valuable information: “the contribution of “local”, “domestic country in rest of Europe”, “other countries in rest of Europe”, and “Extra”. Therefore, the reviewer suggests the author to list a table to provide such information in terms of every city. Special comments: 1. Please the model evaluation of meteorology, PM₁₀, and PM₁₀ compositions before any discussion in the manuscript. Readers are not obligated to read the Part I manuscript. Thus the authors should narrate or at least mention the model performance clearly. 2. On line 71, a comma or no blank between 400 and 000 is suggested. 3. On line 115, please explain the “concept” clearly. On line 116, please explain the meaning of “coarse”. 4. Section 2.1, EMEP is not a meteorology-chemistry coupled model. Please supplement the description of meteorological inputs in current manuscript. 5. Section 2.2, is this study a forecast run or a retrospective run? Please narrate clearly. For such kind of study, a retrospective run is better than forecast run since the meteorology is the reanalysis data and closer to observations. 6. On line 166, please check the URL. The reviewer could not find the webpage. 7. On line 188, the choice of 15% is just because it is large enough to show clear concentration changes? Is there a stronger reason? Moreover, non-linearity represented less than 2% of total

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concentrations for each predicted country contributions but may be larger for cities. Please reconsider your narratives. 8. The authors used zero-out emissions of two cities as a run. Is there any test that has proved hardly interaction exists between these two cities? 9. On line 193, please explain the method of perturbation run clearly. 10. On line 197, does the “Rest of Europe” include the domestic country? In other words, e.g., all areas in Europe in addition to Paris, right? 11. On line 198, “Then, this “Rest of Europe” contribution.by the difference with the “Local” contribution” is suggested to “Then.by the difference between the total and “Local contribution””. 12. On line 201, please narrate “scaled by 15%” more clearly. 13. On line 209, the reviewer could not understand the meaning of 9 “dates”? Is the simulation executed daily? Besides, “9 rest of EU”, why?. What is the 9 reference runs? 14. On line 220, please give a strong reason why the reader is suggested to compare the Fig. 2 in current manuscript and Fig. 1 in in Pommier et al. (2020). 15. On line 223, please explain “4-d” predictions. 16. On line 239, what are the other sources (30-40%) for “Extra sources”? Are they the BCs? 17. Is the variance between city to city and date to date large? Is it proper to express in mean concentrations? 18. On line 241, please calculated the proportion of the “local”, “Domestic country” in “Rest of Europe”, “Rest of Europe” not including the “Domestic country”, for example, Paris. 19. On line 246, the chemically non-linear effect is negative. Please denote the negative term is which minus which. On line 251, if NH_4NO_3 is formed by NO_x and NH_3 in different regions, there is additional PM_{10} formed. Therefore, the non-linear effect is positive, isn't it? 20. On line 256, “If this NO_x is emitted in excess”, why do the authors use “If” in this sentence? 21. On line 262, “it is very small”, what is “it”, “the impact of the percentage” or “the size of the city edges”? 22. On line 271, Please explain the formula (1) is reasonable and persuasive. 23. On line 271, $n=3$, is that representing standard deviation reliable in the view of statistics? 24. On line 275, “It is worth notingother contributions”. Please explain clearly. 25. On line 277, “The limited impact ofare robust”. Please explain clearly. 26. On line 298, the superscript is not needed for dates. 27. On line 300, the underestimated hourly $\text{PM}_{2.5}$ doesn't

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mean the “Local” PM_{2.5} is also underestimated. The underestimation could be due to other sources. 28. Fig. 7, Fig. 8, please denote the full name of countries. Not everyone understands the abbreviations of countries. 29. Fig. 7 captions, what is “countries not included in the country SC runs”? Please explain it clearly in the current manuscript. 30. Fig. 7 captions, “The five main contributors are plotted as well as the difference between the daily mean and the sum of these five contributors (“Rest”).”. This sentence should be split to two sentence: “The five main contributors are plotted as well.” and “The “Rest is the difference between the daily mean and the sum of these five contributors”, right?

Please also note the supplement to this comment:

<https://gmd.copernicus.org/preprints/gmd-2020-242/gmd-2020-242-RC3-supplement.pdf>

Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2020-242, 2020>.

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