GMD Topical Editor decision on manuscript, "Prediction of source contributions to urban background PM10 concentrations in European cities: a case study for an episode in December 2016 by using EMEP/MSC-W r4.15 and LOTOS-EUROS v2.0 – Part 1. The country contributions" by Mattieu Pommier et al.

Two nominated referees reviewed the manuscript in June/July, both finding the manuscript required major revisions, also both agreeing to review the revised manuscript.

Two other reviewers made short comments during the discussion phase, each raising some concerns and additional opinions on the methodologies applied, and their limitations.

The authors have made a substantial number of revisions to the manuscript, and have replied to each of the reviewers comments.

Each of the reviewers have assessed the revised manuscript, reviewer 1 recommending acceptance after minor revisions are made, reviewer 2 finding major revisions are still required.

In recommending major revisions, reviewer 2 notes that the authors have addressed many of the reviewer comments, and that "The agreement metric is better explained in this version".

Whilst the reviewer finds "the most problematic ones are not yet answered sufficiently", the only main concern they raise (aside from the wording of some sentences in the findings) is that the moderate model agreement with observed PM10 may compromise the modelling system's calculated country-contributions to the city pollution.

Reviewer 1's minor revisions are restricted to some deficiencies in the way the text is written, with also suggesting the authors could have carried out a more sophisticated analysis.

My opinion, as Topical Editor, is that the manuscript clearly presents the moderate skill of the model, and readers of the paper will then be aware of the level of skill when considering the conclusions and calculated country-associated contributions.

And whilst my Topical Editor decision must be based on the reviewers recommendations, my opinion is that reviewer 2's finding of major revisions is not sufficiently justified, more consistent with minor improvements, albeit with reservations given the only modest model-obs agreement.

Both reviewers identify that the manuscript has improved, and reviewer 2 now seems content with the method description. Given that the level of skill is clearly presented, I agree with reviewer 1, that the paper can be suitable for publication after minor revisions have been made to improve the way some key sentences with the study's findings are communicated.

I have put together a list of minor revisions to sentences in the Abstract and Conclusion, which once addressed, in my view do now make the paper then suitable for publication in GMD.

Topical Editor review

Minor revisions:

1) Title – delete "by" – improves wording of the title

2) Abstract, line 14 – replace "predictable with" with "which is to be expected given"

3) Abstract, lines 22-23 – this sentence "help to reduce the impact of non-linearity…" I am not 100% sure what the authors mean here, but I think they mean there are unresolved non-linearities due to localised sources not included in the model, or processes occurring at finer spatial scales than the model resolves. I therefore suggest to replace "…impact of non-linearity" with "…impact of missing localised sources or sub-grid-scale processes".

4) Abstract lines 23-24 -- Then the next sentence "This non-linearity… is seen" needs to be re-worded – and it's not clear what is meant by "related to the perturbation". I think the authors mean that the missing sources/processes cause a non-linear response not represented in the models. In which case, that needs to be re-worded, suggest to begin something like "That the non-linearity from the fine-scale processes the models are missing is suggested by the nature of the mismatch … ", clarifying how they infer that to be the case. Potentially the sentence "The use of 15% emission reduction…" sentence might be a precursor to strengthen the attribution to missing local-scale processes, so the authors should consider potentially moving that before the "is seen" sentence.

5) Abstract line 30 – The current wording of this sentence makes it difficult for the reader. The subject of the sentence is re: the dominance of the domestic emissions – the sentence can begin "Over the 34 European cities investigated, PM was dominated.." with the wording clarifying to the specific episode better shortened and moved to the end of the sentence, i.e. finish the sentence ".. for the studied episode (December 1st to 9th 2016)."

6) Abstract, line 31 – Reviewer 2 queried this 68% sentence, but I think they mean to clarify the basis on which this 68% agreement is achieved. You have "on an hourly resolution" but I tend to agree with the reviewer 2, the current wording is unclear. I think though, it is a re-ordering of the wording (as in lines 22-24) to put the subject of the sentence first, and have the few words clarifying the nature of the comparison at the end. I mean re-word to something like, "The two modelling systems generally agree on the dominant external country-contributor (68% on an hourly-basis)…".

7) Abstract, final sentence -- Re-word to shorten the final sentence replacing "results are" with "agreement is" and delete "the determination". Similarly, be clearer by re-wording "for the primary component" with "for primary (emitted) species" and similarly "for the secondary inorganic aerosols" with "for the inorganic secondary component of the aerosol".

8) Abstract final sentence -- Also then re: "Better results are found in the determination the dominant…" there is a missing "of" after "determination". But also it needs to be explained what is meant by "predictable". I think you mean you one would expect greater differences due to the compound nature of secondary species. I mean compound in terms of including differences in emissions & removal seen in primary species, but that secondary species also contain additional differences, e.g. between the models re: oxidation and partitioning, that will tend then to inherently make inter-model differences larger for secondary species. An extra sentence could help explain this.

9) Conclusions, last paragraph, 1st sentence – Improve sentence "It was shown that the results from both" with "We show that results from both…."

10) Conclusions, last paragraph, 3rd sentence – again wording needs to be improved here. In the revise text the new sentence (in blue) says "The differences seen are mainly related to the SIA and is a direct consequence of the different between both methodologies used". I think here you're referring to the point at the end of the Abstract re: primary and secondary components, but that sentence added in the revised manuscript needs to be much clearer. Suggest joining this up with the shorter previous sentence, with a shortened version of that, and be clearer if you mean the different methodology in the two modelling systems, or in the method for attributing to the country. I mean have a single sentence instead as something like "Calculating the country attribution on a daily-mean basis has similar agreement, with most differences related to the secondary inorganic component of the aerosol. Best not to use acronym SIA here with it being the main findings.