

Interactive comment on “Source-sector contributions to European ozone and fine PM in 2010 using AQMEII modeling data” by Prakash Karamchandani et al.

Anonymous Referee #1

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This is a well-written manuscript and its subject matter fits within the scope of the special issue. The organization is clear and the figures and tables are of good quality. The amount of data produced by the source apportionment simulations is impressive. That said, in my opinion the analysis currently presented in the manuscript does not fully utilize the information available from these simulations and should be expanded to provide a more comprehensive picture of source contributions to modeled pollutant concentrations over Europe. Moreover, the manuscript should attempt to make a stronger connection between the model evaluation results and the source attribution calculations. This would not only provide the reader with a sense of the confidence in the source apportionment results, but in turn the source apportionment results may

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provide information on potential sources of model errors. I encourage the authors to consider the following three main comments in revising their manuscript.

Interactive comment

1. The model evaluation results should be made more relevant to the source apportionment results. To this end, evaluation results should be presented for the 16 cities used in the source apportionment analysis, using the monitor(s) available in the grid cell(s) used to define each city in the source apportionment analysis. Furthermore, evaluation results should be presented for the concentration metrics that are used in the source apportionment analysis. This means that for ozone, evaluation results should be presented for summer H1MDA8 and either the H8MDA8 or some other metric related to the top 8 summer MDA8 values (see comment below) while for PM2.5, summer and winter seasonal mean results should be presented separately. If the source apportionment results are expanded for additional percentiles (as recommended in the next comment), this should be done for the model performance analysis as well.

2. The source apportionment results should be presented for a wider range of conditions. For ozone, the analysis should at a minimum include analysis of the eighth highest MDA8 value or some other metric related to the top 8 MDA8 values to make the source apportion results relevant to the top 24 or top 25 values over a three-year period for which the European standard is defined. However, from a process level perspective, I would strongly recommend to show the source apportionment results across the entire distribution of daily MDA8 ozone or daily mean PM2.5 values for a given season. One way to do this might be to show stacked bar charts of sector/source contributions for the 5th, 10th, .. 95th percentiles of simulated concentrations, with the first stacked bar showing the contributions at the 5th percentile, the second stacked bar showing the contributions at the 10th percentile, etc. Such plots could then be used to discuss how the relative importance of different sources and factors changes across the distribution which would provide a fuller picture of the modeled pollutant burden across a range of conditions in the different cities. In addition to the discussion of peak ozone already included in the manuscript, the discussion of contributions to low-to-midrange ozone

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would be of particular interest for this special issue from a background and long-range transport perspective.

3. Finally, the manuscript should be expanded to provide a more thorough analysis and discussion on how model performance for extreme ozone values and across percentiles affects the interpretation of the source apportionment results beyond the fairly high-level statements on page 13, lines 1 – 14.

Specific comments:

Page 1, second-to-last line: remove “comma” after “(Byun and Schere, 2006)”

Page 3, lines 1-10: please also reference the work on long-range transport under Task Force for Hemispheric Transport of Air Pollution (TF-HTAP) that is a key driver for the third phase of AQMEII.

Page 3, lines 23 – 24. Was any nudging performed above the PBL? Please also specify the nudging coefficients.

Page 6, line 3: Did the source apportionment analysis include initial conditions as a factor? If so, what was the value of that factor at the end of the one week spin-up period?

Page 6, lines 5-7: Please provide the number of grid cell(s) selected for each city when calculating the source apportionment results.

Page 9, line 12: suggest rewording “is not to the same extent as for” as “is lower than for”

Page 10, line 8 and page 12, lines 22-23: what are the dominant pathways for SOA formation in London during winter? The 23% (roughly 4-5 $\mu\text{g}/\text{m}^3$) contribution during winter is noteworthy.

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