

This study estimated the source contribution of PM₁₀ concentrations based on a regional air quality forecasting model, and on a scenario approach in European cities. It was found that 20% of the predicted PM₁₀ are from the city contributions (composed of primary PM components) and 60% are from the countries of the regional domain (excluding city contribution), and rest are contributed from the natural sources.

The major weakness of this study is the lack of the model evaluation in terms of the meteorological condition, PM₁₀ concentrations, and the PM₁₀ components. I think this information are strongly needed to ensure that the emission source contributions simulated from the model is reliable. In particular, this information is very important for designing the emission reduction plan in the future. Without these information, I don't think any of the model results can be trusted.

1. Can author state why the focus of the air pollution problem is PM₁₀ instead of PM_{2.5}? It seems nitrate contributes a lot for PM₁₀ in your study region; however, I assumed most nitrate were the fine particles.
2. How serious is the PM₁₀ problem in your study area? What is the characteristics of the PM₁₀ in terms of seasonality and spatial variability? Is PM₁₀ a serious air pollution problem in December?
3. There is lack of discussions of the emission distributions. A graphical demonstration of the emission distributions is very helpful for readers to have a good understanding of the PM₁₀ problem in your study area.
4. There is a lack of the evaluation of the meteorological model performance and air quality model performance. Without this information, I don't think the model simulation results can be trusted.
5. There is a lack of the PM₁₀ composition comparisons between the model and observation. This information is strongly needed to demonstrate that the model result is reliable and can be used to discuss the emission source contributions.
6. An overview of the study episode in terms of the observation characteristics

should be provided.

7. Line 165, the reference year of the anthropogenic emission data set is 2011. How representative is this old dataset when it is applied to discuss the current air quality conditions?
8. Section 4.1, there is a lack of the discussions of the observation characteristics. Fig. 2, there are only model simulation results which is not sufficient to persuade that the source contribution is reliable. A comparison with observation data is needed (e.g. Comparison with observed PM₁₀ and PM₁₀ components, to ensure the reliability of the model results).
9. Line 225, “the chemical reason of the non-linearity is revealed by the negative contributions to the predicted PM₁₀ concentrations”. Please clarify the sentence.
10. Line 230, “The mean PM₁₀ concentration in a smaller area is larger, showing that with a smaller grid, the PM₁₀ is less diffused over the integrated area.” I think the discussions are weird. Isn't the 1-grid cell the closest grid to the emission source so that it has the largest concentrations?
11. Line 232, “The rest of Europe PM₁₀ is mainly influenced by nitrate”. Here, the nitrate concentration should be in the fine particle mode. Please provide evidence that demonstrating the PM compositions are mainly composed by nitrate.

I am also curious why the nitrate occupy a large fraction of PM₁₀ in Europe.
12. Line 249, why the nonlinearity only impact NO₃, NH₄ and H₂O? What about SO₂ and SO₄?
13. Please explain why the eq 1 can be used to estimate the nonlinearity.
14. Line 315, what is the source of the EC and PPM?
15. Please provide evidence to support the SR result from model simulation.
16. It's not the reader's responsibility to read the PARTI of the companion study in order to understand this article. The author need to summarize the findings from the PARTI and explained in this study.

17. Use of “Local” contribution is very confusing.
18. Line 321, “if policies to reduce the local emissions over this area were performed during 02 December, the level of urban background PM10 would have been below the daily 50 ug/m₃”. This statement needs to be supported with more evidence because it involves with the policy decision.
19. Section 5.2, the discussions in Paris and London should be evaluated with the observed data to support the findings.
20. Line 351-352, the source-contribution is done based on a scenario approach; however, due to various experiments are needed to be conducted which take amounts of computational time. How can this be accomplished in an air quality operational mode?
21. What is the main objective of this study? To provide the source contributions for PM10, or to develop a near-real time system that provides the source contributions to PM10? I don’t think the design of the current study meet the study objective. For example, the scenario experiment does not provide comprehensive information of the source contributions. The discussions of developing the real-time source contribution technique are not introduced.