

Interactive comment on “Sources of Submicrometre Particles Near a Major International Airport” by Mauro Masiol et al.

Anonymous Referee #1

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General comments:

This paper presents a study of different components of air pollution at London Heathrow Airport in two periods covering warm and cold environmental conditions. The authors report measurements of both particulate and gaseous pollutants and use k-means clustering and positive matrix factorisation in an attempt to apportion measured pollution to emissions sources and processes.

The dataset is extensive, the measurements are reliable and the analysis methods are appropriate. However, the presentation of the study is poor and therefore, the novel contribution of the paper is unclear. Below are major comments on the paper, after which follow specific line-by-line comments.

The paper has a number of weaknesses, and my opinion is that major revisions are

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required before it is accepted for publication.

1. The literature review is incomplete and must be significantly improved. There have been numerous studies investigating the increased concentrations of UFPs close to airports, which must be included in the introduction. Some of these have been referenced in the discussion of results but inclusion of these references in Introduction is required to place this paper in the context of others and define the novel contribution.
2. The discussion of results is not well-structured, statements are not quantified sufficiently, and explicit references to figures are not included.
3. The section on the results from the k-means clustering (3.2) does not make any definitive conclusions, and it is limited in its contribution to novel science. Most of the results are justified by existing literature. Since that seems to be the case, the section is much longer than is appropriate for reporting routine results. Discussion should be limited to novel results, other results could be discussed in the SI.
4. The discussion of results from the k-mean clustering and PMF analysis is repetitive and many of the same references are used to infer the sources of particular clusters and factors. I would suggest that the discussion of these clusters and factors is combined in order to draw out stronger conclusions from the results (given the discussion in Section 3.3 noting good agreement between the two methods in identifying particular source signatures). The paper would be significantly improved by removing repetition within and the length of the Results section.
5. The paper is overly long and the results are not presented in a concise or coherent manner. There are several instances of repetition.

Specific comments:

Line 57: The statement that aviation growth will continue for the next decade cites a study from 8 years ago. Please use a more up to date reference.

Line 69: No reference for the ‘indisputable’ role of LHR in driving economic affluence

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and vitality is given.

Line 75: Reference(s) for arguments in support of LHR expansion?

Line 82: Reference for Government approval of 3rd runway?

Line 106: Suggest present tense.

Line 108-117: Suggest description of methodology is moved to Section 2.

Line 119-121: Move to Acknowledgements.

Line 150: Repetition.

Line 165: Not all traffic is generated by the airport. Can the proportion be quantified?

Line 196: Suggest delete 'Classical', rephrase.

Line 223: Clarify the reason for deletion of data greater than 99.5th percentile. Is this for all measured quantities?

Line 261: Figures 1 and 2 are not adequately described in the text. If the data is not worth mentioning in the text, the figures should be moved to the SI.

Line 288: This paragraph would be more appropriate in the Introduction.

Line 312: Clarify meaning of 'intensive sampling'.

Line 330: Rephrase sentence 'Airport traffic undergoes...'

Line 340: The statement that nucleation particle concentrations 'drop to near zero overnight' is not substantiated by Figure 3. Statements discussing results must be quantified.

Section 3.1: References to figures should be made to aid interpretation.

Line 344: From Figure 2 it is not clear that accumulation mode concentrations have a peak corresponding to the morning rush hour.

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Line 421-425: Repetition, rephrase.

Line 471: Clarify which clusters are being compared, 'their' is not sufficient. The comparisons between cluster 1 and cluster 5 are confused by the reference to the clusters from the warm period.

Line 482: What is the basis for this interpretation? This seems to be pure speculation.

Line 498: rephrase

Line 514: What is Q?

Line 513-530: These methodological details should be in the Methods section.

Line 765: Rephrase and quantify 'well agree'.

Line 788-796: Literature review should be in the Introduction.

Line 813: Quantify 'fast drop'.

Line 822: Quantify 'just slightly affected'.

Line 827: Quantify 'slightly affected'.

Line 843: 'Anomalously' implies that the measurements are flawed in some way. I do not believe that this is the case. Rephrase.

Line 863: Clarify 'the fingerprint of London'.

Figure 2: Check units of particle number concentrations – values are lower than typical ambient concentrations of 104 part/cm³ and are inconsistent with other figures.

Figure 10: This could be moved to the SI as discussion of it is very brief. Supplementary material: This is not referenced in the main text. It is also lacking any descriptive text and is just a collection of figures. This does not provide the reader with accessible or helpful information.

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