

# ***Interactive comment on “Airborne particles in the Brazilian city of São Paulo: One-year investigation for the chemical composition and source apportionment” by Guilherme Martins Pereira et al.***

## **Anonymous Referee #2**

Received and published: 15 June 2017

### General comments

The manuscript entitled "Airborne particles in the Brazilian city of São Paulo: One-year investigation for the chemical composition and source apportionment" by Pereira et al. investigates the chemical composition of PM<sub>2.5</sub> and PM<sub>10</sub> filter samples collected in an extensive and an intensive campaign on a rooftop inside the USP campus in Sao Paulo City over one year. This year was characterized by low precipitation, high temperatures during the summer, resulting in high concentrations of air pollutants over the whole year. Source apportionment of a high number of investigated pollutants

was performed using PMF, where 5 factors could be identified. Findings were also used for health risk assessments. Although the number of samples is limited over the year, the results give a good and comprehensive general overview of the amount and sources of a high number of investigated pollutants in Sao Paulo City over the seasons. Overall, the work is within the scope of work published by ACP. Therefore, I recommend publication once the comments and questions below are addressed.

The manuscript will need copy-editing, as there are numerous grammatical errors, a few are mentioned below. In addition, some of the figures and tables are not readable without zooming in and should be revised.

Specific comments:

1- Revise the numeration of chapters and subchapters.

2- Abstract: Please explain in short the location of the sampling site in the abstract, and that there is only one site where the samples were collected. As Sao Paulo is a megacity with plenty of possible sites with potentially different sources of pollutants, it should be clear for the reader, that this study is different from several other papers publishing e.g. measurements in tunnels in Sao Paulo. The word airborne in the title and abstract is a bit misleading, as it is mostly associated with measurements on airplanes. It is very important to give the sampling height in the abstract and chapter 1.1.

3- Page 2, line 67: please write which primary sources PAHs have.

4- Table 2: As some species measured from the same instrument have apparently huge DL-differences, it is not helpful to just give the range of DLs. Additionally, add horizontal lines between the different instruments for a better separation.

5- Table 2: For the IC, do all ions really have exactly the same DL (6.4)? If so, the authors should write (in short) the reason for equal DLs and/or refer to a publication for this measurement technique.

6- Page 3, line 135: I guess, all carbon should be 'oxidized' to CO<sub>2</sub>, not 'volatilized'?

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7- Page 5, line 188: At that point, it is not clear for me how "missing data" occur. Do you mean missing filter samples for certain days, or missing data from specific species of a filter sample? If it is the last, how can that happen? Were there some species from a filter measured, but others not?

8- Table S1: Please explain "Therm. Ampl." and the possible reason for its correlation to PM<sub>2.5</sub> and PM<sub>10</sub>. I am asking as these values are highlighted and not mentioned anywhere in the manuscript.

9- Page 6, line 229: Here the authors should make clear, that their data set does not have the data coverage over the year to be fully representative and comparable with the mentioned guidelines. To my knowledge, for both the EU and WHO guidelines, a coverage of 75% for one day and 90% for one calendar year, respectively, is mandatory for a proper risk assessment. Regarding the annual mean limits, the presented data is quite far away from that, considering there is only one day of sampling per week during the extensive campaign.

10- Page 7, line 279: Which other cationic species are you suggesting?

11- Page 8, line 291: Where and at which height were of gaseous species from CETESB measured? Collocated to the filter sampling?

12- Page 8, line 298: A  $R=0.35$  is not relatively higher than  $R=0.78$ . Which correlation(s) are you comparing with  $R=0.35$ ?

13- Table 4: What is the difference between "below detection limit" and "not detected"? Beside that "DL" is not used in table 4, but solely in Table 5, and there, "DL" is not explained.

14 - Page 9, line 347: If the unaccounted part may be attributed to absorbed water, can you see a correlation between this part and ambient humidity?

15 - Page 10, line 447: I do not think it is necessary to mention the location of a chamber (Florida), but rather the institute.

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16- Page 13, line 500ff: The authors mention the strong and weak variables. Do all species, which are not mentioned, belong to the bad variables or are they simple not taken into account? Why and how did you define the 25% additional uncertainty? You combine species from different instruments, which have different uncertainties, as you pointed out in Table 2. Inserting these uncertainties into the error matrix usually cause that PMF strongly under- and overestimated the importance of variables within the solutions. Did you scale in some way the uncertainties to each other? Please explain also, why the organic character of Lev and Man justify to set them as weak variables.

17- Table S7: What do the percentages mean in the last row?

18- General aspects to PMF: I understood that the source of both the RD and VE factor is the traffic. It is not clearly seen in the polar plots (maybe because of the very high RD concentration point coming from NW) how well both factors are correlated to each other. The authors should add a comment on a possible correlation. I also do not understand why all factors were not compared to the gaseous CO and NOx time series, as these gases are commonly used to be correlated with primarily emitted factors, especially traffic sources. This would also justify additionally the authors choice of the 5-factor-solution.

Technical corrections:

Page 2, line 63. Revise this sentence: "Particulate organic carbon includes key species including polycyclic aromatic hydrocarbons (PAHs) and monosaccharides. The last are considered as biomass burning tracers (such as levoglucosan, mannosan, and galactosan)".

Page 3, line 118: use the present tense: intensifies

Page 3, line 118: Revise this sentence: "is presented" should be in the end of the sentence.

Table 1: Its hard to distinguish and attribute some information of the columns to the

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sources. Add horizontal lines between the rows belonging to each source.

Page 6, line 208. Likewise above: Revise this sentence: "is presented" should be in the end of the sentence.

Figure 1: The 1-2 highest precipitation values increase the scale of the plot too large to see any more variations. Revise it to make the plot more readable, e.g. by changing the y-axis scale above 10 mm.

Page 6, line 234: between the words "study" and "was", the word "it" is missing.

Page 7, line 272: Revise the sentence beginning with "It has..."

Page 7, line 276: Begin the sentence with "The ratio..."

Page 7, line 283: write "potassium ions"

Page 8, line 288: write "the intensive campaign"

Table S2: This table is not readable as the letters and values are too small.

Page 8, line 305: write "increase of..."

Page 9, line 338: delete the word "be"

Figure 9a: Write the factors in the legend on the top of the graph in opposite order, in the figure caption as well, because RD is factor 1, IN is factor 2 etc.

Page 13, line 534: Revise the first part of the sentence.

Page 13, line 542: I guess there is the word "but" missing between the comma and "more"

Page 13, line 549: Rephrase the part in brackets into something like "(as seen by high mass loadings of...)"

Figure S3: Neither the axes nor the legends are readable.

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