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## ***Interactive comment on “Hourly elemental concentrations in PM<sub>2.5</sub> aerosols sampled simultaneously at urban background and road site” by M. Dall’Osto et al.***

### **Anonymous Referee #2**

Received and published: 29 October 2012

The subject manuscript addresses the characterization of fine particulate matter at a roadside site and an urban site in Barcelona and a comparison of the metals and sources of metals at the two sites. The sampling was conducted over a one month periods, which included impacts from a dust storm originating in the Sahara Desert. Although the subject matter is of interest to the readership of Atmospheric Chemistry and Physics, there are a number of issues that need to be addressed before the manuscript is suitable for publication.

### General Comments

1) The authors need to more clearly define the goals of the study and the rethink the

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conclusion in the context of the fact that the data presented is only a short snapshot of one month that is impacted by a dust storm. Do the authors believe that the results are representative of other seasons and the annual average? This issue needs to be clarified in the abstract and the conclusions. 2) More information about the quality of the PIXE analysis needs to be provided. Table 1 suggests that very few of the elements measured by PIXE show good agreement with the off-line optical IPC and IPC-MS measurements. Likewise, what can be said about the uncertainties of these measurements that provide the basis for PMF and statistical analyses? 3) The set-up of the PMF model needs to be better explained. It appears that the PMF model only uses the elements measure by PIXE but the manuscript seems to imply that the results are the source apportionment of PM<sub>2.5</sub> mass. Was mass data used to obtain a mass apportionment or is the apportionment just the sum of the measured species. If the apportionment is just the sum of the measured species that this needs to be clearly presented as the absence of OC, EC, nitrate, ammonium and the oxygen component of sulfate is very significant and are not in this sum. 4) The basis of the uncertainties of the measurements used in the PMF model as well as the PMF model sensitivity to the uncertainties needs to be presented or an explanation of why such a sensitivity analysis is not important to the results. Likewise, it would be good to present the sensitivity of the model to the selection of species, factors and extreme events (i.e. dust storm). The robustness of the results depends on the sensitivity of the results to these assumptions and input data.

## Specific Comments

1) Page 20136, lines 6-8 – I imagine that most European aerosol researchers will be familiar with the FP7-EU terminology but given that ACP is an international journal, I think this will be confusing to readers from the Americas and Asia. 2) Page 20136, lines 19-21 – The correlation of the PMF results with the ATOFMS measurements provide some support for the metals measurements but do not really validate the PMF analysis. There could be good agreement with the PIXE and ATOFMS measurements

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and there could still be major issues with the PMF analysis. This statement should be re-written or removed. 3) Page 20140, lines 15-19 – It appears that the uncertainties of the PIXE analysis are based on reference samples. Were any duplicated or Reference materials analyzed to address interferences and uncertainties at low concentrations? 4) Page 20141, line 7 – The use of the “inorganic species” is confusing here. I would recommend inorganic carbon or elemental carbon. 5) Table 1 – Some discussion of the poor agreement of the PIXE and off-line measurements is needed and a justification that the quality of the data is suitable for the analysis and conclusion of the study. 6) Page 20147, line 16 – Are the PMF results really mass apportionment or just the sum of the measured species? 7) Page 20148-20149 – Did the authors conduct a sensitivity analysis to understand if the apportionment results are stable in the context of the dust event, species used in the model. The number of factors, or the measurement uncertainties? 8) Page 20150 – The discussion of the ATOFMS data and Figures 5ab really add very little to the manuscript or the conclusions of the study. I would recommend removing these results unless a more robust and quantitative use of the ATOFMS data can be provided. This is true for section 4.1 as well. 9) Pages 20155-20157 – I find the discussion in section 4.2 to add very little to the manuscript. This seems to restate concepts that have already been discussed and given the short duration of the study, I am not sure that these are higher level conclusion that can be more broadly applied. 10) Figure 1 – There appears to be some missing data from the time series. How was missing data addressed when comparisons of concentrations and PMF results from the two sites were compared? 11) Figure 2 – Were the dust events includes in all of the statistical comparison and the OMF results? Does removing the dust days greatly change the results and conclusions?

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Interactive comment on Atmos. Chem. Phys. Discuss., 12, 20135, 2012.

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