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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Megacity emission plume characteristics in summer and winter investigated by mobile aerosol and trace gas measurements: the Paris metropolitan area" *by* S.-L. von der Weiden-Reinmüller et al.

Anonymous Referee #3

Received and published: 15 July 2014

The manuscript shows a study analyzing the measurements done using a mobile Lab during two deployments (winter, summer) on the Paris metropolitan area. It shows a very thorough explanation on how the measurements were performed and how they were post processed. The measurements were classified as background or affected by the Paris plume, with the methodology of classification also thoroughly described. The classification was used to contrast plume and background conditions, analyze the dilution characteristics of the plume and to explore transformation processes within the plume. The manuscript is well written, the contents are in the scope of the Journal and

I believe it is a contribution to the field. This is why I recommend publication after minor revisions.

My main comment is that I think there is a problem in the methodology used. The main method of air mass classification used in the paper is through enhancements of fresh pollution markers. Afterwards, one of the main results reported is the increase in fresh pollutants from background to megacity air masses. So it's expected that you are going to find these results if you are using the same criteria for classification. I would like to see the methodology validated by using an independent identification of plume emissions, such as backtrajectory analysis, which the authors used but on a very limited part of the study. The authors mention they use meteorological observations and air pollution reanalysis but these are not shown. Some of these examples could be added to the supplemental material.

Other comments:

Page 11265, Lines 14-20. I disagree with the statement "... while air masses further away from Paris show nearly constant background values". On Fig 1b, CO2 shows a clear decreasing trend as you move away from the city. The trend is not so clear in the other chemical species, but the values further away from the city seem to be the lowest. The values you are flagging as Background air masses could be City emission plume diluted after axial transport, or could be that the mobile sampler moved from the center of the plume (higher concentrations) to the side of it (more diluted) as it got away from the city.

Page 11267, Lines 22-24. You could use statistical testing to backup this claim.

Fig 5b. How confident are you that the measurement actually stayed in the direction where the plume was moving? As seen in Fig 5a, city plumes could tend to be narrower than predicted, so maybe that low background value you are finding is because the sampler went quickly out of the plume. Backtrajectory analysis could be helpful here.

ACPD

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Section 3.4, “Quasi-Lagrangian axial measurements:” The results of this sub-section are not showed in tables or figures. You could show them in the supplementary material.

The Summary states “The cross sectional profile of the plume is typically Gaussian-like while the axial decrease of fresh pollution concentrations shows an exponential shape.” However, the authors present only 1 case for each. More cases need to be added (maybe just in the supplement) to backup these conclusions. Also include model results to see how representative is the case shown in the main manuscript.

Technical corrections:

Change Beekman 2013 to 2014

Page 11261, Lines 3-4. This sentence is not clear; it contradicts the sentence in lines 7-8. Please rephrase.

Page 11261, Lines 7-8: Change to “Therefore, data points with intense peaks in the organic time series were removed before PMF was applied.”

Page 11265, Line 1. Fig 1 does not show PAH, shows HOA.

Fig. 2. You could add the mean in the box and whisker plots as a symbol in the middle of the box/whisker. The mean is in Table 1 but I think it’s better to repeat this information in the box and whisker plots. Page 11267 Line 5 and Fig 2 Caption says that this figure has the “mean” but it’s not plotted. The box and whisker represent the data distribution, not the mean.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 11249, 2014.

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