

Interactive comment on “On the simultaneous deployment of two single particle mass spectrometers at an urban background and a road side site during SAPUSS” by Manuel Dall’Osto et al.

Anonymous Referee #1

Received and published: 8 March 2016

In this study, the results from a field campaign in Barcelona (Spain) in which for the first time two ATOFMS were concurrently deployed in a urban background site and a roadside site are presented. The two instruments had different inlet configurations. Although this may have hampered a direct comparison between the two sites, it was useful to be able to detect more efficiently different characteristic particle types that are likely to be anyway rather unique to the specific site. In my opinion the manuscript present interesting new insights into single particle composition and atmospheric processing and it is suitable for publication in ACP after addressing the comments that follow.

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Page 7, lines7-8: Please specify how air was dried (e.g. Nafion[®] tube or silica drier) and what the RH downstream was. How often was the drier regenerated to maintain the same RH during the sampling campaign?

Directions of air masses are often discussed in the text. Please add details on how they were obtained and please show (in the SI) the examples that are discussed, like NAF_W, NAF_E, and regional transport vs. long range, air masses from Europe. Please define NAF_E the first time that it is mentioned.

Page 12, line 6. Please add correlation coefficient. Is the anticorrelation between LRT-NIT and LRT-SUL affected by the “rainy periods” mentioned a few lines after? Does the correlation change if we exclude those periods? I suggest showing rainfall on the timeseries of these two clusters in Figure S1. Why are these two particle types more abundant in the roadside site rather than in the urban background site if they come from long range transport? Does it depend on inlet configuration of the two instruments?

In general, are diurnal profiles of particle types detected at the roadside site affected by wind speed and direction considering that the site is closed to a street canyon and therefore wind direction can be a key parameter for transporting pollutants from the street to the sampling site?

Page 20-21. I do not find convincing the argument around the Amine (ETS 84) being from tobacco smoke. The diurnal trend itself does not seem to suggest that. Are there any concurrent data that can support this conclusion like gas phase concentration of nicotine or other cigarette smoke markers? Does Amine (ETS 84) correlate with gas phase nicotine in either a direct or time-dependent way? Also, the authors compare the mass spectrum of Amine (ETS 84) with the mass spectrum of a particle type previously reported in Athens. The comparison is done with an analysis of the correlation using r^2 but this assumes that data are normally distributed which is very unlikely for a mass spectrum where the multiple null values will definitely cause a skewed distribution. From a qualitative point of view, the mass spectra look actually different in the sense

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that signals of CN-/CNO- are missing in Amine (ETS 84) which are expected from a combustion source and they were main peaks reported in the cited study in Athens. I suggest being more cautious in relating the observed particle type to tobacco smoke unless additional data are available and reported to confirm this hypothesis.

Page 23, lines 10-11: The authors suggest that m/z 118 could not be associated to secondary processes as they have found it in two particle types that they relate to fresh emissions. Oxidation processes can occur on a very short time scale and the fact that Amine 58 shows diurnal peaks with 1-h delay respect with rush hours seem to point out that atmospheric processing is occurring on the particles. It would be interesting to show correlations with RH, T and irradiation since, for example, particle phase oxidation is limited by uptake of oxidants on the particles which is favoured at high RH (Bedjanian, et al. *Atmos. Environ.* 2010, 44, 1754–1760; Slade, et al. *Geophys. Res. Lett.* 2014, 41, 5297–5306).

Page 26, lines 1-3. OC-CHO seems to be associated with oxidation of aromatics by OH radical which is reported also in a previous study from the same authors among other studies (Giorio, et al. *Environ. Sci. Technol.* 2015, 49, 3330-3340; Bedjanian, et al. *Atmos. Environ.* 2010, 44, 1754–1760 ; Platt, et al. *Atmos. Chem. Phys.* 2013, 13, 9141-9158).

Page 26, lines 5-9. I found this part very interesting and I think that more discussion is worthwhile to add about the atmospheric processing at different times during the day.

Page 29, line 21. Authors suggest that concentrations of ammonia are higher at the roadside site. Emissions of ammonia from vehicular traffic have been widely reported and they are likely to increase in the future because it is not a regulated pollutant (Suarez-Bertoa, et al. *Environ. Sci. Pollut. Res.* 2015, 22, 7450-7460).

Page 30, lines 18 to 23. I do not fully understand this paragraph. May you clarify the discussion around the different amine types and different formation processes and how these are linked to the observations? There is a lot of information but I am not sure I

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can follow the flow and perhaps other readers may find this part confusing too.

Page 31, lines 1-3. High RH favours aqueous processing in general because aerosol is more likely to be in a deliquescent or partly deliquescent form (Saukko, et al. *Aerosol Sci. Technol.* 2015, 49, 531-537).

Page 31, lines 16-18. Could OC-Aro-NIT be associated with reactions between aromatics and NO₃ radical?

Interactive comment on *Atmos. Chem. Phys. Discuss.*, doi:10.5194/acp-2015-986, 2016.

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