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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Particle size distribution of nitrated and oxygenated polycyclic aromatic hydrocarbons (NPAHs and OPAHs) on traffic and suburban sites of a European megacity: Paris (France)" *by* J. Ringuet et al.

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We would like to thank the Referee 1 for his interesting review. All comments have been taken into consideration.

As explained to Reviewer 3 (C4646, Page 5 lines 27-29), the comparison made here concerns two sites of really different typologies (suburban vs traffic). Weather and temperatures were similar and we expect that the comparison of the observations made is relevant. A priori, at traffic site, the influence of long-range transport of pollutants is

poor (site is located at 2 meters away from the ring road of Paris). At the suburban site, we expected to observe an influence of long-range transport of pollutants and aerosol ageing. Additionally, we only have one MOUDI sampler and for this reason, it was not possible to perform samplings at both sites in the same time.

Yes, the samplings were done continuously. Samplings duration was 24 h. Due to low concentrations in ambient air, all the impaction media (aluminium foils) of the same particle size range were extracted together. For the traffic site, it represented 7 filters corresponding to 7 sampling days (from the 09/07/2010 to the 09/13/2012). For the suburban site, particle size distributions obtained are a combination of 16 filters sampled continuously (from the 07/15/2009 to the 07/30/2009). This will be specified in the final version of the manuscript.

We agree with Reviewer 1 that is really difficult to compare results from these two devices. We presented here a comparison of the results obtained with the two samplers and showed that concentrations were not strictly the same for all compounds. As specified to Reviewer 3, to our knowledge, this kind of comparison was never reported in previous similar studies on particle size distribution of OPAHs and NPAHs. Here, we try to propose possible explanations in order to justify such differences. Again, it is not perfect but it has the merit to exist.

In the Item 2.4, there is a mistake in the references. Just for information the reference Albinet, 2006 refers to the PhD thesis of Alexandre Albinet and Albinet et al., 2006 to an article published in Journal of Chromatography A about the analytical method used also here. This will be corrected in the final version of this paper.

The recovery rates presented in the section 2.4 are those obtained by Albinet et al., 2006 and were not reevaluated in the present study. In details, the recovery rates were between 14 % (1-nitronaphthalene) and 84 % (7-nitrobenz[a]anthracene) for NPAHs; and from 5 % (1-naphthaldehyde) to 83 % (benzo[b]fluorenone) for OPAHs (Albinet et al., 2006). This will be specified in the final version of the article.

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Observed 9-NA and 9,10-Ant concentrations are clearly higher for the DA-80 device than the MOUDI. These compounds are known to be partitioned, in ambient air, in both, gaseous and particulate phase (e.g; Albinet et al., 2007; Albinet et al., 2008). The differences observed could be explained by the reduce pressure on the lower stages of the impactor (MOUDI) inducing the desorption of these semi-volatile compounds. For 1-NP, the differences between both samplers are not significant. Note that, these three compounds were the most abundant quantified OPAHs and NPAHs. No problem of limit of quantification could explain the differences observed.

Uncertainty values for 3-Nphen; 4-NP; Benz-one, etc, are really high. This is mainly due to the fact that, certified concentrations for these compounds are not available for the SRM 1649b. By neglecting this parameter, uncertainties fall in the range 22 to 140 %. Please see also the detailed explanations reported in the answer to Reviewer 3 (C4644 bottom page - C4645). These details will be specified in the final version of the article.

We agree that Figure 2 is not simple to read at first sight. To our opinion, this configuration is the easiest and the most complete in order to study the link between the NPAH and OPAH particle size distribution and the origin these toxic compounds. If reviewer 1 has a better idea, we are totally ready to listen it.

The separation of 2- and 3-NFlt could not be achieved with the chromatographic column used (5 % phenyl-substituted methylpolysiloxane phase). In ambient air, the proportion of 3-NFlt is largely lower than 2-Nflt [< 1% (Bamford and Baker, 2003; Zielinska et al., 1989) and <50% (Feilberg et al., 2001)] allowing to use +3-NF/1-NP ratio (Ringuet et al., 2012; Albinet et al., 2007; Albinet et al., 2008). This will be specified in the final version of the manuscript.

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