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***Interactive comment on* “Size distributions of polycyclic aromatic hydrocarbons in urban atmosphere: sorption mechanism and source contributions to respiratory deposition” by Y. Lv et al.**

Anonymous Referee #3

Received and published: 24 August 2015

This is an interesting study focusing on the fate and impact of atmospheric particle-phase polycyclic aromatic hydrocarbons (PAHs). It particularly focuses on the size distribution of a series of PAHs, for which the sorption mechanisms is only partially understood but which is central for their transport in human respiratory system. This study evaluates a series of measurement performed over one year period (2012–2013) in Shanghai. Most PAHs were observed to be adsorbed on the small particles, with some seasonality.

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I do find this paper very interesting, with all measurements performed according to the best available standards. I'm however also convinced that it would gain in strength if carefully reedited to improve the use of the English language but also to provide more discussions and input on a few key points which are listed below.

The lifetime cancer risk is used as a metric for quantifying the health impacts of the measured PAH. However, this metric is not really defined. This would clearly help the reader to assess the importance of the current findings.

The terminology "less-ring" to more-ring" PAH is used at various places. I do find this too vague without few lines defining what is meant in the contexts of the present study. I would encourage the authors being more precise here. For instance Figure 3 depicts some bimodal distribution of 3 to 6 rings PAHs, while some other figures carries information about total PAHs, without clearly explaining why this is done this way.

The seasonality reported in Figure 2 appears finally to be quite weak and made on "standard" seasons, but is this in agreement with the local weather (e.g., dry versus wet seasons, and so on)? Also why plotting total PAHs for highlighting the seasonality as the later might be more pronounced for given molecules? Also I did found that the discussion about the seasonality can be revised to clarify and strengthen the message the authors want to convey.

In section 3.2, maybe the authors could clarify the link they are making between size of the particles and ageing time.

The content of section 3.3 is unclear to me. What is the benefit of that statistical analysis? It can indeed reproduce the observed size distribution of the PAHs but can this be related to some fundamental properties of the PAHs (such as volatility)?

Minor points

Abstract (in general the abstract could be improved and shortened) Line 5 : check the syntax of that sentence. Line 9: exists Line 24: $(1.5 \cdot 10^{-6})$... what is the meaning of

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that number?

Page 20813 Line 9: phases Line 11: what is meant with PAH composition? Speciation?

Page 20814 Line 16: distribution

Page 20815 Line 22: This is a Fudan... Line 27: the site is also in close proximity to two major streets i.e., ...

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 20811, 2015.

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15, C6196–C6198, 2015

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