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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 #2**

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This study shows the dependency of PAH fraction on particle size. The authors try to explain the sorption mechanism and the aging in the atmosphere and evaluate the cancer risk through inhaling. Furthermore they study the source of PAHs related to particle size.

Overall message: the topic is very interesting, but the article should be edited. The issues need to be explained in a more understandable way.

They show clearly that PAHs mainly adsorb on smaller particles, which will penetrate

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deeper into the respiratory system and might cause cancer. The seasonal variations, they describe and show in fig. 2, seem not to be crucial. If they are significant, maybe they can plot it in a different, more clear way. What do you want to show/tell with fig. 4? Is it just PAH/PM decrease with bigger particles? Because this message is already shown in fig. 3. I don't understand the link between decreasing PAH/PM and BaA/CHR with size and aging process. (page 20823, line 13-15 "This indicates that...") You don't know (or at least you don't write it) the initial ratios at the source so you don't know the changes. In general, like you write, the aging process results in decreasing ratios, but that would mean that the ratio for smaller particles decrease faster than for bigger, as smaller particles have a longer lifetime and are transported longer, so there is more time to be aged. Fig 6 shows clearly that many mechanisms are involved at the sorption process. The analysis done within the statistics is unclear. Which parameters are used to predict PAHs? Physical and chemical properties? The measured and the predicted values match each other well, but what is the conclusion? What is the benefit of section 3.4? Why is it important to know the sources of PAH in different particle sizes (fig 10)? You should explain the meaning of the value of LCR. (6.3 people out of 10 000 000 people get cancer or how to read it???)

Language/spelling/grammar: What do you mean with less- and more-ring PAHs? Better describe it with the ring number, or molecular weight – less ring e.g. 2-4(?) -ring, ... Page 20816, line 11: Aitken (not aitken) Fig. 4: Aitken mode (not Akiten)

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