Atmos. Chem. Phys. Discuss., 13, C278–C281, 2013
www.atmos-chem-phys-discuss.net/13/C278/2013/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Source apportionment of ambient fine particle from combined size distribution and chemical composition data during summertime in Beijing" *by* Z. R. Liu et al.

Anonymous Referee #1

Received and published: 27 February 2013

This paper describes the results on sources affecting fine and ultrafine particles in Beijing, over a one month summer campaign carried out in 2011. The authors of the manuscript did the source apportionment analysis by combining HR-ToF-AMS and SMPS data, by using PMF. This is not the first time this kind of work is presented, but at the same time this is not frequent. The authors have sown in the manuscript a fairly good review of previous similar studies carried out worldwide. The authors have found that 8 sources are explaining most of the variability of the particle and volume concentration between 15 nm and 2.5 μm. Most of the combustion sources are evident in the ultrafine modes, whereas those arising from mechanical processes such as road dust, or the regional component are found in accumulation and droplet modes.

Although the manuscript is well organized, the figures are clear, and the results are in general satisfactory, there are some points that need a review.

1)Pag 1368, line 7: solid mode exhaust. I particularly don't like this name. It's quite ambiguous. Maybe you may label this factor as "primary vehicular exhaust emissions", or some similar term.

2)Pag 1368, line 17: Add "," after "Overall"

3)Pag 1368, line 19: Find an alternative word to "population".

4)Pag 1369, line 1: Please replace as follows: "Since particles in ambient air. . ..to particle conversion, a better understanding of the source attribution of particles is needed for investigating the associations between specific particle sources and health, but also for policy makers to introduce effective abatement strategies.

5)Pag 1369, line 25: Please remove from ". . .would be expected. . ." to . . .measured spectra", since this is an assumption not necessarily true and not important here.

6)Pag 1370, line 8: Please replace as Oguleia by Ogulei; add Pey et al., 2009

7)Pag 1371, line 2: Please add some information about the inlet system (diameter, flow inside, material, length). Was some correction applied? It is strange because it seems that a unique inlet was used, but individual cutoff inlets were used for SMPS-APS ad AMS systems. Even brief this information should be provided.

8)Page 1371, line 16. Given that this point is very important in the context of this study, how was the fitting between APS and SMPS data? Did you any correction applied to fit both dataset? Maybe you should include something in the supplementary materials.

9)Page 1372-1373: PMF section. You talk about missing values replacement but you don't mention the amount of missing values in the database. Please provide this information.

10)Page 1374, line 10. Even that cooking emissions may be relevant, are you com-

pletely sure about the attribution of this factor to cooking? The 40 nm mode is also very typical of urban emissions from traffic. As far as I can see in the manuscript, this source is that experiencing the largest daily variations, with two peaks (as you state at midday and in the evening). This source is also linked to NO2. I am afraid that this is the largest source to particle number in Beijing. During the Olympic Games in 2008 the authorities prohibited emissions from many sources but I am pretty sure that cooking was not prohibited. And air quality was significantly improved... I suggest checking specific markers in the HR-AMS data for cooking emissions, and show them in the manuscript given the magnitude of your findings.

11)Page 1375, line 8-15. You state that this factor has a positive correlation with NOx to support your interpretation as a traffic factor. But association with NOx is even better for the previous one (cooking factor). You also mention the relation with truck traffic in the ring-road, only allowed from 00:00-06:00. I think this factor is related with traffic, but not specifically with truck traffic since it should display a marked daily trend and it's not. In my opinion the trend could be related with dilution processes rather than traffic patterns.

12)Page 1377, line 8. Why this factor 4 (regional pollution) shows minimum concentrations in the afternoon?

13)Page 1377, line 18. I totally agree with the explanation given in the text. In fact, the daily trend of factor 5 and factor 6 is opposed, and may be explained as follows: the volatilization of ammonium nitrate particles at noon release ammonia to the atmosphere, captured by HSO4 and SO42- to form particles.

14)Page 1379, lines 5-19. I agree that this factor is related with road traffic but it's too hard to say that is road dust, a coarse component built-up of mineral matter and metals essentially. Given that you didn't measure metals, neither mineral dust, and your size distribution finish in 2.5 μm, I would change the name. In addition, warm areas usually show an important coarse nitrate component, not related with road dust but with Ca and

Na (from soil dusts or sea salt). Such coarse nitrate particles, as yours, are indicative of ageing of air masses at local and regional scales.

15)Page 1380, line 13. "Coal consumption" or "coal combustion"?

16)Page 1380, line 27. Change "diversification" by diversity/variety/mixture.

17)Page 1381, line 5. You have to convince me about this very high cooking relevance.

18)Page 1381, line 21. Remove from "..., including..." to "...VOCs,"

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 1367, 2013.