

***Interactive comment on* “Simultaneous Measurement of Urban and Rural Single Particles in Beijing, Part I: Chemical Composition and Mixing State” by Yang Chen et al.**

Anonymous Referee #3

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This work did a nice job in measuring the chemical composition and mixing states of aerosols at an urban and a rural site in Beijing. More than 4 million particles were detected at each site, of which the chemically analyzed particles were grouped and analyzed to investigate the potential sources and atmospheric processing. The authors found that the urban particles were influenced significantly by rural processing and transport. The paper is generally well-written, and I recommend it for publication after some addressing the following comments.

Comments: 1. The authors listed several studies in paragraph 2 in Introduction, but didn't contain any conclusion. What does it mean by "discrepancies remain among

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these studies"? Authors need to be more specific about what discrepancies exist among the studies. Please revise/rephrase, and be more specific.

2. It should be noted that chemical bias of SPAMS might introduce uncertainties in representativeness of ambient particles and even in classification of chemically analyzed particles. I think there is a need to mention this caveat in your paper, and caution the readers that uncertainties may be expected for the results. This can be provided either in Introduction or Discussions.

3. Please clarify the differences between this study and previous studies. The significance of this study is not well written in the paper.

4. L150: The EC category has four types including EC-Nitrate (EC-Nit), EC-Sulfate (EC-Sul), and EC-Nit-Sul. Is it "four", not "three"? Or there is another type?

5. According to line 243, K-rich is one of branches of k-rich category. According to Figure 6a, K-rich means BB (BB in figure 6 caption, and K-rich in the figure) According to line 366, BB-related particle means K-rich category. The use of K-rich category, K-rich type, BB and BB-related particle is confusing. Please make the description more clear, specific and concrete.

6. As you mentioned in Line 253, the household BB is prohibited in urban Beijing, which is inconsistent with figure 6c indicating that the highest number counts of K-rich were observed when wind speed was less than 2 m s⁻¹, is that possible K-rich_PKU can also from other sources?

7. L295: "mass spectra of NaK category contained f Na⁺, K⁺ . . ." Please correct.

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