

***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 #4

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The authors performed simultaneous observations of size-resolved single-particle chemical composition and mixing state in both urban and rural areas of Beijing. The campaigns collected more than 4 million particles being at both sites. The authors have investigated the different sources, processing, and origination of atmospheric particles at both sites. Generally, the manuscript illustrates a substantial contribution to the scientific understanding of urban particulate pollution in China. Particularly, the clustering strategy used in this work can be very useful to illustrate different stages of atmospheric processing. The manuscript is concisely organized and well written. Therefore, the reviewer prefers publishing if the following concerns are addressed.

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Major comments

1. The statement in the Introduction should be more clarified between Lines 47–53. The discrepancies should be described, and a conclusion or hypothesis should have been drawn from the literature review. 2. Also, could you be specific on this “limited attention to the atmospheric particulate processing?” It is very important because it provides the novelty of this work compared to previous studies. 3. Lines 101–112. The use of relative peak area to determine the aging of particles is interesting. As we know, matrix effect could alter the ion intensities of each ion. The authors should address the possible influential factor for bias. 4. Table 1. The reviewer strongly suggests a column of comment on the source of particle types at both sites, respectively. 5. Section 3.2.5. Is it possible to use the polar plots at both sites to locate the potential source of Fe-rich particles? 6. Please compare the -Sul particles at both sites because the sulfate-rich particles can be formed from the oxidation of SO₂. Any difference in the origin of sulfate-rich particles at different sites? Please add additional analysis or comments to Discussion. 7. Section 3.4. according to the claim in the manuscript, both OC-PG and ECOC-PG are supposed to be local. However, the polar plot suggests that these particle types are from multiple directions, please explain.

Minor and technical

Lines 385: “detailed” should be “details.” Line 421. “small” should be “limited.”

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-933>, 2020.