

Interactive comment on “Measurement report: Comparison of wintertime individual particles at ground level and above the mixed layer in urban Beijing” by Wenhua Wang et al.

Anonymous Referee #2

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Review of “Measurement report: Comparison of wintertime individual particles at ground level and above the mixed layer in urban Beijing” by W. Wang, et al.

General comments

This manuscript presents work analyzing the characteristics of aerosol particles collected at two different heights (ground level and above the mixed layer height) in Beijing. The samples analyzed using TEM and EDS to generate both images of the particles as well as elemental composition. The samples are compared between two different types of environments: haze and non-haze. Classes of compounds that were identified include mineral, organic particles, soot particles, particles that contained sulfur (both

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alone and mixed) as well as other types of internally mixed particles. The results from this study are interesting and the figures and discussion are clearly written. However, there are a few locations where more information or a clarification of statements would improve understanding. I would recommend acceptance after addressing the following minor concerns.

Specific Comments:

1. For the EDS analysis, were multiple places on the particles probed? It looks like they were based on the data in Figure 2. On page 5 line 128, you mention that the duration was 15 s to reduce damage. Please also include information in the methods on how many spots per particle were sampled.
2. For the area equivalent diameter calculations described on line 134 you are assuming particles are spherical. However, there are clearly non spherical particles in the figures. Please clarify what assumptions are being made and the uncertainty that can come from those assumptions in reporting the size distributions.
3. On page 6 lines 160-161 and also throughout the summary, statements are made about the organic particles (OP) coming from coal combustion or biomass and fossil fuel. How is this known? I agree that this could be a source, but how can you rule out other sources like secondary organic aerosol? Please clarify how this assignment of the source for these particles is being made.
4. In section 3.4 a comparison is made between samples at ground level and the samples collected on the tower. The averages are used for these comparisons, but some of the samples look like that trend is consistent across all the samples, and for others there is more variation. Please clarify where there is consistency and where there is more variation between the trends discussed for the average values.
5. On page 8, line 226: “In this study, we found that the core-shell structured particles accounted for 20% during haze periods but only 2% during non-haze periods”. Was

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this for the average of both heights? Or only one of the sample types (ground vs. tower)?

6. The area equivalent diameter is larger during haze periods (line 227-228). I can also see that more of the particles above the MLH have a thin coating surrounding them (Figure 5). However, the viscosity and the flattening behavior of these particles is not discussed. A more liquid-like coating will flatten more when the particle is impacted (collected), leading to a larger observed diameter on the substrate. This should be mentioned in the text and the effect of this on the calculated diameters and assumptions about coating thicknesses (amounts of aging in the manuscript) should be discussed. It is possible that the particles are actually quite similar in size, but that the physical properties of the films are different between the two heights. Was there a difference in RH during collection on the tower vs. at ground level? A different RH could mean more water associated with the particles and potentially a difference in viscosity for the coating.

7. Minor comments:

a. The green color on Figure 1 is hard to see

b. Add an explanation to the caption on Figure S3 to explain what it means to calculate the coating size; in the text it is discussed as an R value, but in Figure 6 it is the C/S ratio.

c. Are the times in Table 1 showing collection at 1 am (for example)? Or is that supposed to be 1 pm? Note, if these are at night, that should be much more clear in the text and you should discuss the implications (day vs. night, photochemistry, etc.).

d. Minor errors in grammar should be corrected to improve readability.

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2020-1031>, 2020.