Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2020-539-RC2, 2020

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Tracing the evolution of morphology and mixing state of soot particles along with the movement of an Asian dust storm" *by* Liang Xu et al.

Anonymous Referee #2

Received and published: 3 August 2020

The study by Xu et al. investigates the aging of soot particles during Asian dust event. The authors collected samples at three sites and compared soot aging at single particle basis. They mainly used transmission electron microscopy (TEM) to study morphology of soot particles. Several morphological descriptors such as aspect ratio, fractal dimensions are used to quantify morphology of soot particles and they classified mixing state of soot-bearing particles based on their coating thickness. They found that soot particles are compact with highest fractal dimension of soot collected at coastal site (T3) in southwestern Japan. They suggested that compact morphology is due to condensation of secondary coating material and though phase separation at high humidity during transport. The research topic is certainly relevant, but I have several concerns.

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Discussion paper

There is not much discussion about the chemical composition of soot-bearing particles. Did you perform any chemical analysis?

The backtrajectory analysis is not properly discussed in the manuscript. However, this is key for the dust event discussion. I didn't follow the cold front arrival. The authors should discuss in more detail.

What is the relevance of dust storm here? If soot particles are studied during a dust storm, why the authors didn't observe or discuss about mixing of dust and soot particles. The authors should discuss about number fraction of soot particles that are mixed with dust particles and size distribution of both dust and soot particles.

The authors should discuss about the size distribution of three types of soot particles. How did the authors calculate fractal dimension of partially embedded and fully embedded soot particles? For type 3, especially for the fragmented soot ones, it is difficult to measure the required parameters to calculate fractal dimension. They should also provide fractal dimension separately for all three types of soot.

The discussion about the mixing state configuration needs to be elaborated, like how many soot particles did you observe within individual partially embedded soot particles? How many fragments were observed in type-3 (figure 3d). This information would be useful to understand the aging process and for modeling purposes.

Need to discuss how many soot particles were studied per sample. How many total samples during event? Overall, particle statistic is poor.

If phase separation may be a key mechanism for observation of fully embedded particles, the authors can investigate fraction of fully embedded particles at different RH, not just by sampling site. The RH was high too during certain time at T2 site. The authors should investigate those samples as well.

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