Comments: This papers uses a combination of an SP2 with a sizing instrument to deliver information concerning BC mixing state, which is topic of much interest us. We would like to take this opportunity to make the authors aware of a previous work we have published on the subject (Yu et al., 2020), which also used monodisperse SP2 measurements to generate the Riemer-style mixing state metrics, albeit classified using a CPMA rather than a DMA. Can the authors comment on how comparable the metrics produced by the two techniques are?

Reply: Thanks for the comment. Yu et al. (2020) provided the detailed single-particle level mixing state information, which can contribute to future studies concerning BC lifetime and transportation to help to constrain the simulation of BC radiative effects. The mixing state metrics proposed in our method are basically the same as that of Yu et al. (2020). The derived mixing state index from the CPMA-SP2 systems without any assumptions while that from the DMA-SP2 systems with the assuming that the effective density of the BC-containing coating material are the same as that of non-BC particles.

However, our manuscript mainly focus on the relationship between the mixing state index with light absorption enhancement and demonstrating that the mixing state index can be further used in model to quantify the BC light absorption enhancement. Our study offer new insights that the mixing state index can contribute to improvements in the accuracy of simulating the BC radiative effects.

We added some discussions in the manuscript.

Yu, C., Liu, D., Broda, K., Joshi, R., Olfert, J., Sun, Y., Fu, P., Coe, H., and Allan, J. D.:

Characterising mass-resolved mixing state of black carbon in Beijing using a morphology-independent measurement method, Atmospheric Chemistry and Physics, 20, 3645-3661, 10.5194/acp-20-3645-2020, 2020.