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The authors combined SP2 measurements and Mie theory calculations to provide evidence for the reduction of black carbon (BC) light absorption due to the APEC emission control. The paper is well written. I have one minor suggestion on the uncertainty associated with the calculation/analysis of BC light absorption.

We would like to thank the reviewer for the valuable and constructive comments, which helps us to improve the manuscript. Listed below are our responses to the comments point-by-point, as well as the corresponding changes made to the revised manuscript. The reviewer's comments are marked in black and our answers are marked in blue, and the revision in the manuscript is further formatted as '*Italics*'.

Recent observations (e.g., China et al., 2015; Wang et al., 2017) have shown various complicated BC coating structures/morphology, which are not core-shell. Further modeling studies (e.g., Scarnato et al., 2013; He et al., 2015, 2016) have indicated a large variation in BC absorption and scattering due to the observed complex particle coating structures/morphology. Thus, assuming a core-shell structure in the present study may lead to uncertainty in the estimate of BC light absorption. It would be helpful if the authors could include these recent studies and add some discussions on this issue.

Response: According to the referee's suggestion, we have added the following discussion in the manuscript, as shown below:

"*The actual shape of BC-containing particles in the atmosphere was complex (China et al., 2015; He et al., 2015; He et al. 2016; Scarnato et al. 2013; Wang et al., 2017). In this study, we focused on investigating the BC-containing particles during pollution episodes. Under polluted conditions, we have found fully aged BC-containing particles in Beijing, China (Zhang et al., 2018). In our previous study (Zhang et al., 2016), we found that the thickly coated BC particles in the north china* *plain (including Beijing) exhibited near-spherical shape and a core-shell structure used in the Mie calculation was reasonable.*"

References:

China, S., et al.: Morphology and mixing state of aged soot particles at a remote marine free troposphere site: Implications for optical properties, *Geophys. Res. Lett.*, 42, 1243–1250, doi:10.1002/2014gl062404, 2015.

He, C., et al.: Variation of the radiative properties during black carbon aging: theoretical and experimental intercomparison, *Atmos. Chem. Phys.*, 15, 11967-11980, doi:10.5194/acp-15-11967-2015, 2015.

He, C., et al.: Intercomparison of the GOS approach, superposition T-matrix method, and laboratory measurements for black carbon optical properties during aging, *J. Quant. Spectrosc. Radiat. Transf.*, 184, 287–296, doi:10.1016/j.jqsrt.2016.08.004, 2016.

Scarnato, B. V., et al.: Effects of internal mixing and aggregate morphology on optical properties of black carbon using a discrete dipole approximation model, *Atmos. Chem. Phys.*, 13, 5089–5101, doi:10.5194/acp-13-5089-2013, 2013.

Wang, Y., et al.: Fractal dimensions and mixing structures of soot particles during atmospheric processing, *Environ. Sci. Technol. Lett.*, 4, 487-493, doi:10.1021/acs.estlett.7b00418, 2017.