

Interactive comment on “Reduction in black carbon light absorption due to multi-pollutant emission control during APEC China 2014” by Yuxuan Zhang et al.

Anonymous Referee #2

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General comments:

The present manuscript reports variations of the refractory BC (rBC) particles measured by a single particle soot photometer before/during/after APEC summit. The shell diameter of rBC-containing particles were determined according to Mie scattering theory presuming that all rBC particles were in shell-core configuration. The objective of this study is to evaluate the effect of emission control measures on the mixing state of rBC as well as their light absorbing properties, and concluded that coating matters on the rBC core decrease as a result of emission control of pollution precursors such as SO₂ and NO₂. In general, the paper is clear logically and well written; however

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deficiencies of this study is the absorption enhancement (E_{ab}) is estimated based on calculation, not measurement. Direct measurement of optical properties of rBC particles is essential to better understand the radiative effect of rBC containing particles in Beijing. The paper could be considered for publication after several issues are carefully clarified, as follows:

Page 4 line 16: The authors assumed that all the rBC containing particles were in spherical shape, please make sure they are true or not. As known, on-road vehicle emission is one of the important sources for rBC particles in Beijing mega city, freshly emitted rBC may present in non-spherical shape, and they may turn to be spherical with ageing process. The authors are suggested to check the number size distribution and delay time (Δt) to clarify this.

Page 5 section 2.3.2: As mentioned, E_{ab} is determined on Mie theory, not measurements. Please point out the uncertainty of such calculation related to RI values. Adding an uncertainty in Figure 6 is encouraged.

Page 6 line 11: The authors attribute the decrease in ambient rBC and NO₂ on the emission controls. It is encouraged to give more discussion show diurnal variations of their concentration (Sun, Y. et al. “APEC Blue”: Secondary Aerosol Reductions from Emission Controls in Beijing. *Sci. Rep.* 6, 20668; doi: 10.1038/srep20668 (2016), as well as back trajectories of air mass during APEC and non-APEC period to support it.

Page 6 line 24: It is hard to understand the meaning of the sentence “The similar mode of ... and similar atmospheric processes (coagulation and wet removal) for rBC particles ... APEC.” The predominance of rBC in ~100 nm range is mostly due to incomplete combustion processes (vehicle engine etc.). It is better to remove it.

Page 7 line 4: “condensational growth was more effect”. Please provide more information to support such statement.

In the third paragraph, Where is “Fig. 4b”? What is the reason for the difference in

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diurnal variability of Dc before and after APEC period?

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2018-274>, 2018.