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Comment on acp-2021-637

Anonymous Referee #2

Referee comment on "Measurement report: Long-term changes in black carbon and aerosol optical properties from 2012 to 2020 in Beijing, China" by Jiaxing Sun et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-637-RC2, 2021

The manuscript by Sun et al. investigated black carbon and aerosol optical properties from 2012 to 2020 in Beijing, which is an important work to understand long-term changes of black carbon, aerosol optical properties and radiative effects after clean air action. Here, the authors applied a relatively mature experimental design to conduct a long-term observation. The results showed that large reductions in eBC and light extinction coefficient of fine particles were about 67 % and 47 %, respectively. And the most significant reductions of eBC were occurred in the fall and night time, mainly due to the changed primary emissions. Comparatively, SSA and MEE considerable increases highlight an increasing importance of scattering aerosols in radiative forcing, and a future challenge in visibility improvement due to enhanced MEE. Besides, the authors also quantified the primary and secondary BrC, demonstrating an enhanced role of secondary formation in BrC in recent years. In the last, the influences on direct radiative forcing from changes in BC and BrC are estimated. The whole result analysis in this study is systematical, thoughtful and in a well-organized manner. According to the state of the art, and the conclusions are supported by the data, so I consider that it fulfils the necessary requirements to be published. I recommend it for publication on Atmospheric Chemistry and Physics after the authors consider several minor revisions to the manuscript.

Comments:

Please clarify eBC in abstract.

line 30&34, “during 2018-2020” format should be consistent, please check the full text.

line 63, “accounting for 25 ~ 35 % 2010” should be “accounting for 25 ~ 35 % in 2010”.

line 84, ignore the punctuation. Please check the full text.

line 107, Please check the Spaces after commas in the right subscript of the full text (e.g., babs, BC).

line 123, “the correlation (R2)” should be “the correlation coefficients (R2)”.

Line 160-170, it would be helpful to compare with a study about the seasonal variation of ΔBC/ΔCO in Beijing influenced by vertical transport of BC and wet scavenging. (Black carbon emission and wet scavenging from surface to the top of boundary layer over Beijing region, JGR-atmosphere, 125(17), 10.1029/2020JD033096, 2020.)

line 163, Change “-” to “–”

line 186 ~ 187, lack a preposition in this sentence. Please rewrite.

line 193, “the diurnal variation of eBC (Fig. 4) showed morning peaks” should be “the diurnal variations of eBC (Fig. 4) showed morning peaks”.

line 208, diurnal variation of winter in 2020 was not showed in Fig. 4. Please rewrite this sentence.

line 209, “One reason was likely due to the fact that” could be “One reason was likely because”

line 214, “the eBC presented similar distribution with high concentration in the middle and also the… “should be “the eBC presented similar distribution with high concentration in the middle and the…”.

line 241, “is close to” should be “was close to”.

line 244, “Fig. 7” should be “Fig. 6”.

Please check the spaces of the full text (like line 107, e.g., babs, BC).

Line 310-315, a study which observed enhanced BrC contribution on absorption when heavy pollution could be referenced. (In situ vertical characteristics of optical properties and heating rates of aerosol over Beijing, Atmospheric Chemistry and Physics, 20(4), 2603–2622, 10.5194/acp-20-2603-2020, 2020.)