Atmospheric Chemistry and Physics Discussions

Atmos. Chem. Phys. Discuss., referee comment RC1
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Review

Anonymous Referee #1

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-RC1, 2021

General comments

This paper presents data from about a 9 year period showing a general decrease in black carbon aerosol in Beijing and the implications of that decrease for single scattering albedo and radiative forcing. Overall, this work provides a useful study for publication, but a number of items should be addressed in the final draft.

First, carefully proofread the paper for grammar, proper word choice, etc. I list a few things below, but I do not list all the errors in the current draft.

Second, the MRS method is newly developed and not cited much; thus, I think it would be appropriate to provide a bit more detail in your paper on how this method separates primary and secondary BrC. If necessary, provide some graphs in the Supplemental.

Likewise, I do not understand the Monte Carlo simulations of uncertainties on radiative forcing. Please explain this process better.

Regarding data interpretation, please comment on the fact that in Figure 1, the major downshift in eBC concentration corresponds to the switch from one aethalometer to the other. Did the old model have a higher uncertainty or more noisy signal? Please detail the extra correction you refer to in line 93, as this correction plays a role in how these data look on Fig 1.

It is quite interesting that the eBC and CO both drop by nearly exactly the same

percentage from 2012 to 2020, and yet the emission ratio of delta eBC / delta CO also changes, thus indicating a change in primary emission source. My question is in regards to how you calculate the emission ratio - why do you use a mean or initial eBC value of zero while you don't for CO? Provide justification in the text. Also, if there is any uncertainty to performing the calculation this way, what effect would that have on your final emission ratio trends?

Talk more about the possible emission sources and how they match to your emission ratio calculation.

You mention biomass burning as a significant source of BC, and we see in the data that BC emissions are decreasing over time. Can you elaborate on what types of biomass burning: wildfires, prescribed fires, residential heating, etc. are prevalent in the study area or may be transported over the site?

Why does the change in primary emission come in 2018, when the clean action plan was for 2013-2017? Did nothing happen until the end of the 5 year plan?

There are a number of places that say ``similar to previous studies'', or something like that. Can you also highlight what is new and different about your measurements that make your study unique?

Discuss Fig 10 some more. How significant are these numbers in terms of the total radiative balance? What implications for long-term changes to climate do these numbers show?

Specific comments

Be precise about how you refer to ``9 years of data''. There are actually large gaps in your dataset, as presented in Fig S1.

Be consistent with how you refer to black carbon aerosol - you go back and forth between ``BC'' and ``eBC''. I believe you are actually measuring eBC as you defined in the methods section. Make sure to fix the abstract also.

A map of the study area showing the sampling locations would be nice and would provide context for Fig 5.

Are b_{abs} and b_{abs,BC} the same thing? I'm looking at equations 2 and 5.

Lines 145, 148, 150 - why aren't these equations separated and numbered like others in the paper?

Lines 157 and 179 are essentially the same sentence.

Fig 1 - the triangles are hard to see. Also, ``BC'' or ``eBC''?

Fig 2 - need error bars showing uncertainty or scatter in the data. Otherwise, we don't know how significant the monthly variations are.

Line 175 - actually 2014 had an increase too

Should ``clean air action plan'' be capitalized as a specific document or law?

Line 215 - Why is 2012 an exception?

Line 218 - Why is regional transport only important some of the time?

Line 315 - How do you know 2020 had a stronger atmospheric oxidation capacity?

Figure 5 - Why not use the same color scale on each plot?

Is it necessary to show the top rows of Figures 6 and 7? These are just Figures 3 and 4 multiplied by a constant and therefore don't show anything new.

Fig 8 - the colors are hard to see

Technical comments

There are quite a few technical corrections to be made for grammar, word choice, etc. Only a few will be listed here; there are too many to write all of them out. One common mistake is missing articles such as ``the''. Another common confusion is the use of ``this'' and ``it'' as subjects in a sentence when these terms are no always clear as to what they are referring to.

Line 244 - do you mean Fig 6?

Line 269 - ``similar'' to what?

Line 307 - ``similar'' to what?

Line 351 - ``POA'' is never defined

Check the bibliography carefully; there are formatting errors throughout.