

Response to the editor's comments

We are thankful to the editor for the comments. We have revised the manuscript accordingly. Listed below is our point-to-point response in blue to each comment that was offered by the editor.

Comments to the author:

The authors have properly addressed the comments of the anonymous referees and they have modified their manuscript accordingly. However, alterations and corrections are needed for both the Main text and Supplement before the manuscript can be published in ACP:

Main text:

Line 13: Replace "Spectrometer" by "Spectrometry".

Lines 27, 60, and 285: Replace "in North" by "in the North".

Lines 28 and 288: Replace "showed much" by "showed a much".

Line 38: Replace "to soot and element" by "to as soot or elemental".

Line 39: Replace "of planetary" by "of the planetary".

Line 44: Replace "induced by" by "induced by the".

Line 48: Replace "while a" by "versus a".

Lines 49, 185, and 269: Replace "of mixing" by "of the mixing".

Line 51: Replace "used the" by "used".

Line 53: Replace "for characterization of size" by "for the characterization of the size".

Line 54: Replace "environment" by "environments" and replace "of soot" by "of the soot".

Line 58: Replace "more" by "a more".

Line 60: Replace "spectrometer (SPA-MS)" by "spectrometry (SPAMS)".

Line 61: Replace "most of BC" by "most BC".

Line 62: Replace "in heating" by "in the heating".

Line 64: Replace "winter particularly" by "winter, particularly".

Line 65: Replace "in NCP are" by "in the NCP, are".

Line 67: Replace "in NCP" by "in the NCP".

Lines 70, 202, 277, and 294: Replace "of BC" by "of the BC".

Line 71: Replace "in mixing" by "in the mixing".

Line 79: Replace "then, aerosol" by "then aerosol" and replace "the thermodenuder" by "a thermodenuder".

Line 80: Replace "and bypass" by "and a bypass".

Line 84: Replace "250 °C" by "250°C".

Line 87: Replace "in TD" by "in the TD".

Line 92: Replace "in ambient" by "in the ambient".

Line 96: Replace "inform" by "obtain".

Lines 96, 97, and 122: Replace "SPA-MS" by "SPAMS".

Line 105: Replace "by Computational" by "by the Computational" and replace "in MATLAB" by "in the MATLAB".

Line 108: Replace "with the peak areas" by "with peak areas".

Line 117: Replace "in positive" by "in the positive".

Line 121: Replace "are shown" by "are given".

Line 124: Abbreviations and acronyms should be defined (written full-out) when first used; therefore replace "bulk OA" by "bulk organic aerosol (OA)".

Line 128: Replace "PMF analysis" by "PMF analyses".

Line 130: Replace "of error matrix (in supplementary)" by "of the error matrix (in the Supplementary)".

Line 135: Replace "than that in GC (73%) yet higher than that" by "than in GC (73%) yet higher than".

Line 137: Replace "of aerosol" by "of the aerosol".

Line 138: Replace "spectra of" by "spectra of the".

Line 140: Replace "indicating that" by "indicating that the".

Line 141: Replace "80% of" by "80% of the".

Line 142: Replace "of secondary" by "of the secondary".

Line 143: Replace "that BC" by "that the BC".

Line 145: Replace "40% of" by "40% of the".

Line 167: Replace "that high" by "that a high".

Line 168: Replace "showing decreased" by "showing a decreased".

Lines 171, 295, and 298: Replace "as the increase" by "with the increase".

Line 174: Replace "in urban" by "in the urban".

Line 175: Replace "half of" by "half of the".

Line 176: Replace "in rural" by "in the rural".

Line 182: Replace "affect mixing" by "affect the mixing" and replace "with previous" by "with a previous".

Line 187: Replace "half day" by "half a day".

Line 188: Replace "during P1" by "during the P1".

Line 189: Replace "of haze" by "of the haze".

Line 191: Replace "causing high" by "causing a high".

Line 200: Replace "Similar variation" by "A similar variation".

Line 202: Replace "were similar" by "was similar".

We made all corrections as the editor suggested.

Line 203: The sentence part "which was characterized by most significant increase in BC_{OCN} rather BC_N as the PM increased" is unclear to me; it should be rephrased.

Following the editor's comment, we rewrote this sentence as: "Different from Beijing, the evolution of BC mixing state was similar during most of the haze events in GC (Figs. 2c and S3), which was generally characterized by a more significant increase in BC_{OCN} than BC_N ."

Line 213: Replace "of total" by "of the total".

Line 215: Replace "between chemical" by "between the chemical".

Line 216: Replace "we summed" by "we summed the".

Line 217: Replace "represent secondary" by "represent the secondary" and replace "of positive" by "of the positive".

Line 219: Replace "in total" by "in the total".

Line 220: Replace "between peak" by "between the peak" and replace "and mass" by "and the mass".

Line 221: Replace "As the increase" by "With the increase".

Line 223: Replace "of haze" by "of the haze".

Line 226: Abbreviations and acronyms should be defined (written full-out) when first used; therefore replace "POA" by "primary OA (POA)".

Line 228: Replace "than SIA at both" by "than that of secondary inorganic aerosol at both the".

Line 233: Replace "Light" by "The light".

Line 235: Replace "in BC" by "in the BC".

Line 238: Replace "were likely" by "likely".

Line 239: Replace "As the progress" by "With the progress".

Line 242: Replace "was closed to 0. Pervious" by "was close to 0. A previous".

Line 245: Replace "in atmosphere" by "in the atmosphere".

We made all corrections as the editor suggested.

Line 251: It is unclear what "CAPS" in "TD-CAPS" is; it should be written full-out.

Thank the editor's comment. It was spelled out in the revised manuscript: "We also estimated the E_{abs} in summer 2017 using the same method and compared with the measurements by a cavity attenuated phase shift single scattering albedo monitor coupled with a thermodenuder (Fig. S9)."

Line 252: Replace "average about" by "average of about".

Lines 255 and 256: Replace "mixing state" by "mixing states".

Line 256: Replace "respectively to" by "respectively, to".

Line 261: Replace "and internally" by "and became internally".

Line 272: Replace "led to an" by "lead to an".

Line 276: Replace "The detail" by "The detailed" and replace "in supplementary" by "in the Supplementary".

Line 279: Replace "of radiative" by "of the radiative".

Line 282: Replace "on radiative" by "on the radiative".

Line 289: Replace "with large" by "with a large" and replace "of clean" by "of the clean".

Line 295: Replace "at both" by "at both the".

Line 298: Replace "in the increase of" by "in the increase of the".

Line 299: Replace "particles in" by "particle type in".

Line 300: Replace "different mixing" by "a different mixing".

Line 301: Replace "internally mixed" by "internal mixing".

Line 371: Replace "amp, apos, Connor" by "O'Connor".

Line 399: Replace "Allen, James D." by "Allen, J. D.".

Line 505: Replace "The digital" by "Digital".

Line 507: Replace "in mass" by "in the mass".

Line 508: Replace "in individual" by "in the individual".

Line 522: Replace "percentiles of" by "percentiles of the".

We made all corrections as the editor suggested.

Supplement:

Page 1, line 13: Replace "Mass Spectrometer" by "Mass Spectrometry".

Page 2, line 1: Replace "PMF" by "Positive matrix factorization (PMF)".

Page 2, line 2: Replace "state on Eabs" by "states on light absorption enhancement (Eabs)" and replace "of PMF" by "of the PMF".

Page 2, line 3: Replace "particles," by "particles (for the definitions of babs, total, babs, BCpure and BC, see the main text)

Page 2, line 2 below equation (1): Replace "in j row. LODs" by "in the jth row. The LODs".

Page 2, line 4 below equation (1): Replace "PMF solutions" by "the PMF solutions".

Page 2, line 5 below equation (1): Replace "mixing state" by "mixing states".

Page 2, line 9 below equation (1): Replace "by pervious" by "by a previous".

Page 2, line 4 below equation (2): Replace "Wavelength" by "The wavelength".

Page 2, line 6 below equation (2): Replace "is effective" by "is the effective".

Page 2, line 7 below equation (2): Replace "between aerosol" by "between the aerosol".

Page 2, line 8 below equation (2): Replace "and light" by "and the light" and replace "from PAX" by "from a photoacoustic extincniometer (PAX))".

Page 3, heading of Table S1: Replace "A summary of abberviations and descrptions" by "Summary of abbreviations and descriptions".

Page 3, in the right column of Table S1: replace "Dall et al., 2012" by "Dall'Osto and Harrison, 2012".

Page 3, heading of Table S2: Replace "A summary of relationship between aerosol optical depth and light" by "Summary of the relationship between the aerosol optical depth and the light"

We made all corrections as the editor suggested.

Page 3, Table S2: The first column is unclear. I presume that the unit of the "Effective Height" is in m; but what does "slope" do after m? And what does "r" denote? This first column should be modified.

Following the editor's suggestion, we revised Table S2 (replaced by Table R1), and added the description of the first column.

Table R1. Summary of the relationship between the aerosol optical depth and the light extinction coefficient measured by PAX at both sites. The slope represents the effective height and r represents the correlation coefficient.

	Beijing	Gucheng
Effective Height	711	554
(m)		
<i>r</i>	0.73	0.51

Page 4, Figure S1: It is unclear to me what "ramian" in the ordinate denotes.

It should be "remaining". We corrected the typo in the revised manuscript.

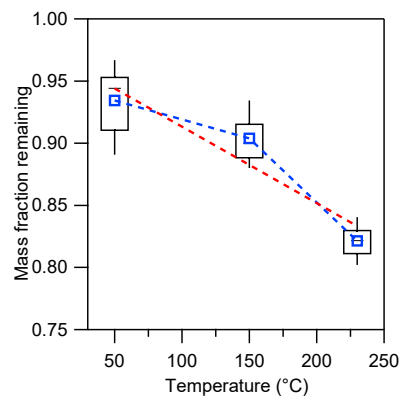


Figure R1. Loss of pure BC particles in the thermodenuder under different temperatures.

Page 4, caption of Figure S1: Replace "The loss of pure BC particles in TD" by "Loss of pure BC particles in the thermodenuder".

Page 5, last line: Replace "in BJ (left panel) and GC" by "in Beijing (left panel) and Gucheng (GC)".

Page 6, caption of Figure S3: Replace "in BJ and GC" by "in Beijing (BJ) and Gucheng (GC)".

Page 6, first line of the caption of Figure S4: Replace "The relationship between the sum of mass" by "Relationship between the sum of the mass".

Page 6, second line first line of the caption of Figure S4: Replace "in GC" by "in GC (for the definitions of NR-PM1 and eBC, see the main text)".

Page 7, caption of Figure S5: Replace "PM, FFOA and BBOA in Case2" by "NR-PM1, FFOA and BBOA in Case2 (with FFOA standing for fossil fuel-related organic aerosol (OA) and BBOA for biomass burning OA)".

We made all corrections as the editor suggested.

Page 7, caption of Figure S6: Replace "Eabs" by "light absorption enhancement (Eabs)".

Page 8, caption of Figure S7: Replace "in GC." by "in GC); for the definitions of OC, SOA, eBC LO-OOA, MO-OOA, OOA and aq-OOA, see the main text.".

They were corrected following the editor's comments.

Page 9, caption of Figure S9: Replace "The comparisons" by "Comparison".

Page 10, line 1: replace "Dall, amp, apos, Osto, M., and Harrison" by "Dall'Osto, M. and Harrison".

Corrected as suggested.