Supplement of

Long-term changes in black carbon and aerosol optical properties from 2012 to 2020 in Beijing, China

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Table S1. A summary of Mann-Kendall trend test for air pollutants from 2013 to 2020.

	Entire	Spring	Summer	Fall	Winter
	τ (p-value)	τ (p-value)	τ (p-value)	τ (p-value)	τ (p-value)
eBC	**-1** **(0.01)**	**-1** **(0.01)**	-0.4 (0.33)	**-1** **(0.01)**	-0.4 (0.33)
eBC/$PM_{2.5}$	-0.6 (0.14)	0.4 (0.33)	-0.4 (0.33)	**-0.8** **(0.05)**	**-0.8** **(0.05)**
eBC/CO	-0.6 (0.14)	**-0.8** **(0.05)**	-0.4 (0.33)	-0.6 (0.14)	**-0.8** **(0.05)**
b_{ext}	**-0.8** **(0.05)**	**-0.8** **(0.05)**	- -	**-0.8** **(0.05)**	-0.4 (0.33)
SSA	**1** **(0.01)**	- -	**0.8** **(0.05)**	**0.8** **(0.05)**	**0.8** **(0.05)**
MEE	0.4 (0.33)	-0.2 (0.62)	**0.8** **(0.05)**	- -	-0.2 (0.62)

Table S2. A summary of relationship between aerosol optical depth and light extinction coefficient measured by CAPS in four seasons.

	Entire	Spring	Summer	Fall	Winter
Effective Height (m, slope)	1233	1200	1800	964	635
r	0.64	0.66	0.76	0.72	0.72

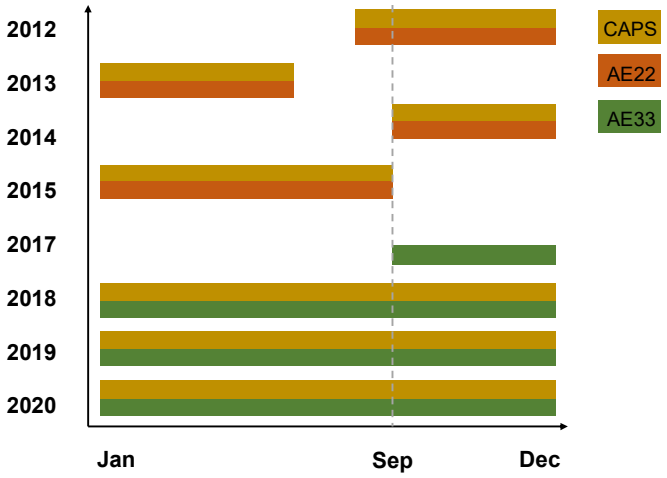

Fig. S1. Schematic representation of instrument deployment in different years.

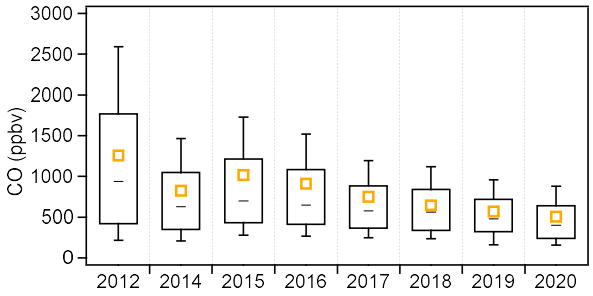

Fig. S2. Annual variation of CO concentration. The median (horizontal line), mean (square), 25th and 75th percentiles (lower and upper box), and 10th and 90th percentiles (lower and upper whiskers) are also shown, same as below.

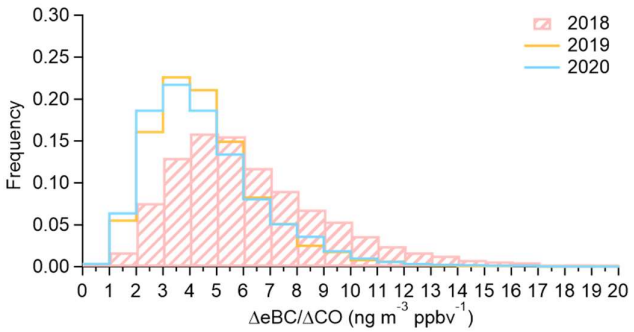

Fig. S3. The frequency distributions of △eBC/△CO in the past three years.

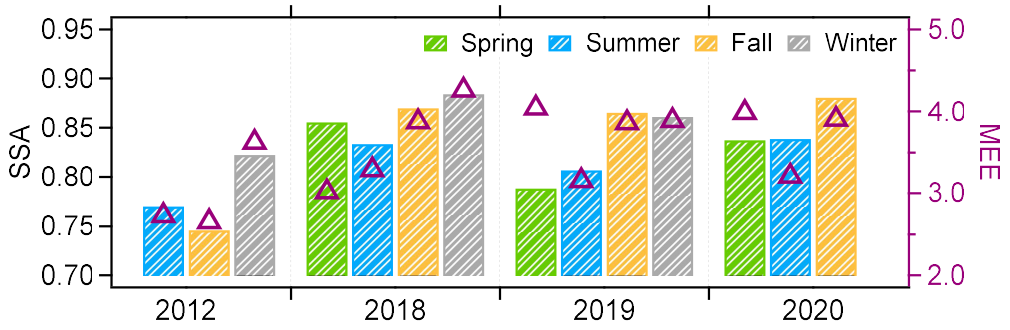

Fig. S4. Seasonal mean of SSA and MEE.

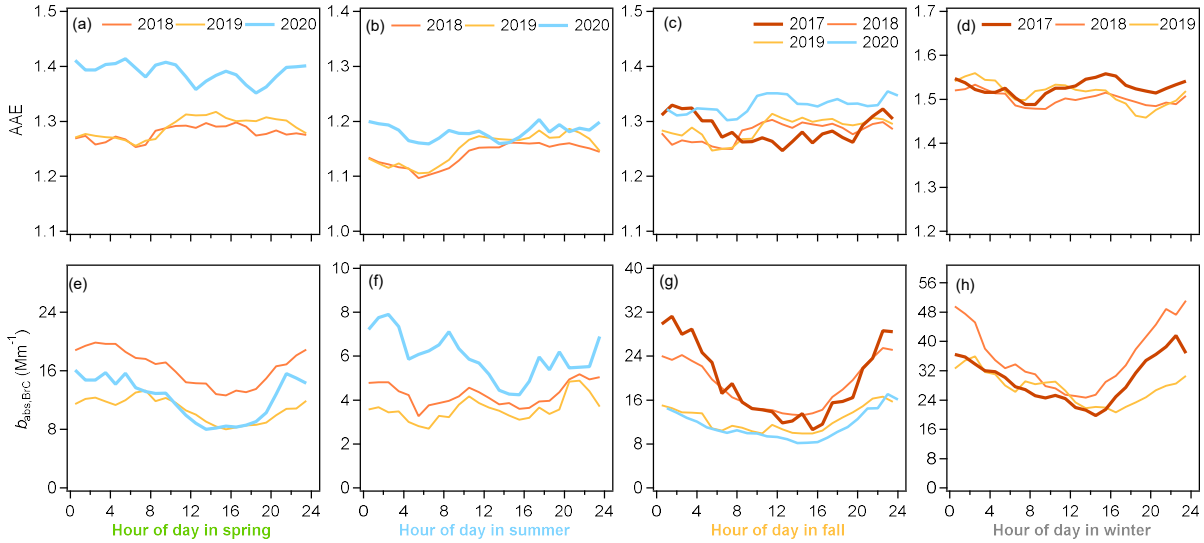

Fig. S5. Diurnal variations of AAE and $b_{abs,\,BrC}$ for spring, summer, fall and winter time in different years.

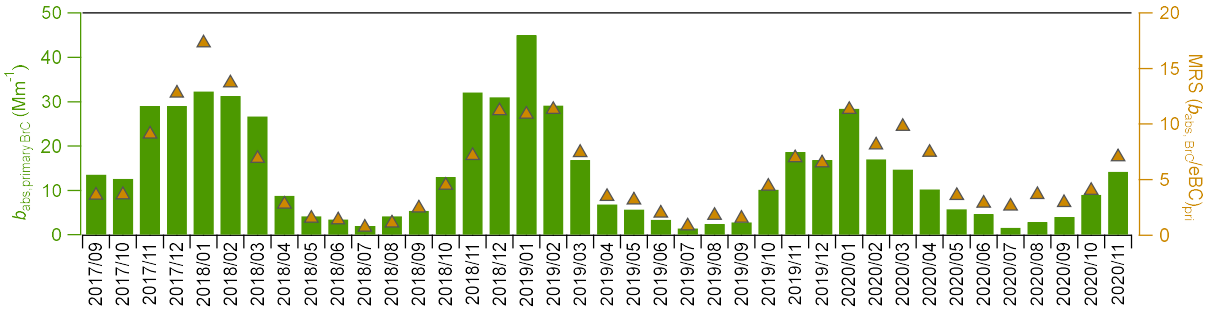

Fig. S6. Monthly variations in results of MRS and $b_{abs,\ primary\ BrC}$.

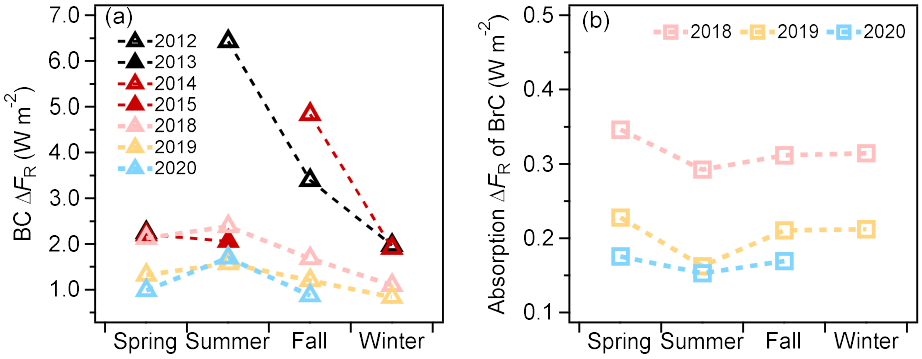

Fig. S7. Seasonal variations of BC ΔF_R and BrC absorption ΔF_R.

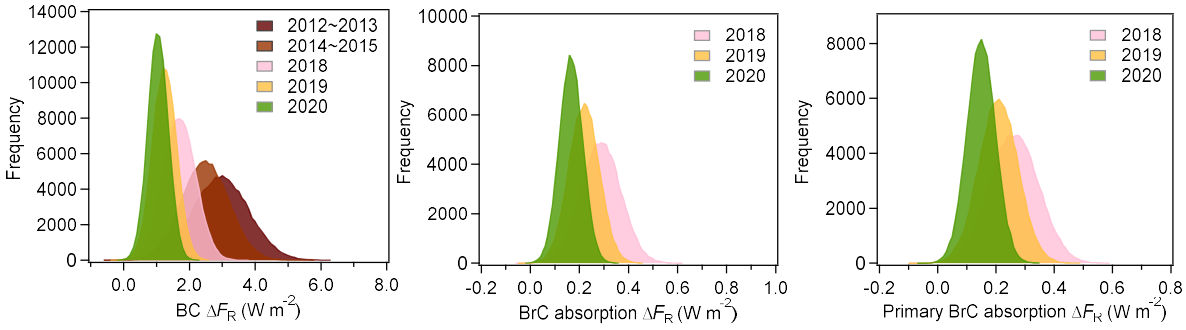

Fig. S8. Probability distributions of ΔF_R for BC, BrC and primary BrC based on 100,000 Monte Carlo simulations.