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Measurement report: Optical characterization, seasonality, and sources of brown carbon in fine aerosols from Tianjin, North China: year-round observations

Zhichao Dong et al.

Correspondence to: Chandra Mouli Pavuluri (cmpavuluri@tju.edu.cn)

Table S1. Mass concentrations of WSOC, WIOC and absorbance efficiency of WSBrC and WI-MSBrC (Range & Median) in $PM_{2.5}$ from Tianjin, North China.

		Annual		**Summer**		**Autumn**		**Winter**		**Spring**	
		Range	Median	Range	Median	Range	Median	Range	Median	Range	Median
Concentrations											
WSOC ($\mu g\ m^{-3}$)		0.69–16.0	2.56	1.14–3.12	1.74	1.16–7.68	3.13	1.37–16.0	4.19	0.69–4.03	2.44
WIOC ($\mu g\ m^{-3}$)		0.00–8.93	1.01	0.00–1.33	0.38	0.21–5.07	1.39	0.00–8.93	3.33	0.23–2.62	0.73
Optical parameters											
WSBrC	$Abs_{365}(Mm^{-1})$	0.49–36.7	2.94	0.49–3.16	1.23	0.55–13.5	3.09	2.35–36.7	8.27	0.66–13.3	2.94
	$MAE_{365}(m^2\ g^{-1})$	0.38–3.41	1.14	0.38–1.98	0.64	0.40–1.76	1.02	0.90–3.08	2.02	0.52–3.41	1.34
	AAE(300–500 nm)	3.85–7.99	5.65	3.90–6.88	4.90	5.12–7.99	6.17	4.50–7.39	5.88	3.85–7.57	5.27
	E_2/E_3	3.30-7.66	5.18	3.64-7.66	5.74	4.61-7.66	5.59	4.18-6.22	5.15	3.30-6.25	4.80
	FI	1.13–1.63	1.37	1.16–1.49	1.32	1.36–1.61	1.45	1.29–1.44	1.37	1.13–1.63	1.37
	BIX	0.79–1.39	1.03	0.79–1.04	0.91	0.83–1.26	1.06	1.03–1.39	1.19	0.82–1.24	1.00
	HIX	1.72–4.17	2.86	2.47–3.98	3.00	2.11–4.17	2.97	1.72–3.72	2.48	1.84–3.76	2.87
	k_{365}	0.017–0.149	0.050	0.017–0.086	0.028	0.018–0.077	0.044	0.039–0.134	0.088	0.023–0.149	0.058
	$SFE_{Abs300–400\ (W\ g^{-1})}$	0.60–5.13	1.74	0.60–2.99	0.97	0.81–5.13	1.55	1.40–4.76	3.14	0.62–2.71	2.00
	$SFE_{Abs300–700\ (W\ g^{-1})}$	0.98–13.1	4.50	1.22–10.5	2.95	1.48–12.5	3.30	3.75–13.1	7.56	0.98–6.36	4.99
WI-MSBrC	$Abs_{365}(Mm^{-1})$	0.32–25.0	1.54	0.40–1.26	0.71	0.32–11.0	2.08	2.85–25.0	9.45	0.44–11.3	1.36
	$MAE_{365}(m^2\ g^{-1})$	0.18–7.05	2.26	0.89–7.05	1.66	0.18–4.70	1.50	2.01–3.42	2.71	0.42–5.81	1.96
	AAE(300–500 nm)	2.08–12.9	5.99	4.27–9.19	5.05	2.08–12.9	5.72	5.49–6.76	6.29	3.94–8.38	6.30
	E_2/E_3	3.32-24.1	6.16	4.32-9.58	6.58	3.32-10.1	5.31	5.28-7.73	6.11	4.50-24.1	6.96
	FI	1.29–2.24	1.59	1.34–1.92	1.58	1.48–1.73	1.57	1.61–2.24	1.71	1.29–1.77	1.51
	BIX	0.83–1.76	1.27	0.92–1.65	1.36	0.83–1.36	1.05	1.20–1.62	1.42	0.94–1.76	1.22
	HIX	0.11–2.38	0.59	0.11–0.49	0.25	0.30–2.38	1.34	0.62–1.79	1.44	0.11–1.26	0.34
	k_{365}	0.0080.307	0.098	0.039–0.307	0.072	0.008–0.205	0.065	0.0870.149	0.118	0.018–0.253	0.087
	$SFE_{Abs300–400\ (W\ g^{-1})}$	0.64–8.84	2.89	0.60–2.99	0.97	0.75–7.01	2.34	3.04–5.29	4.15	0.64–8.84	2.94
	$SFE_{Abs300–700\ (W\ g^{-1})}$	0.92–51.3	7.55	1.22–10.5	2.95	0.92–51.3	6.47	7.06–11.7	9.14	2.48–21.8	6.28

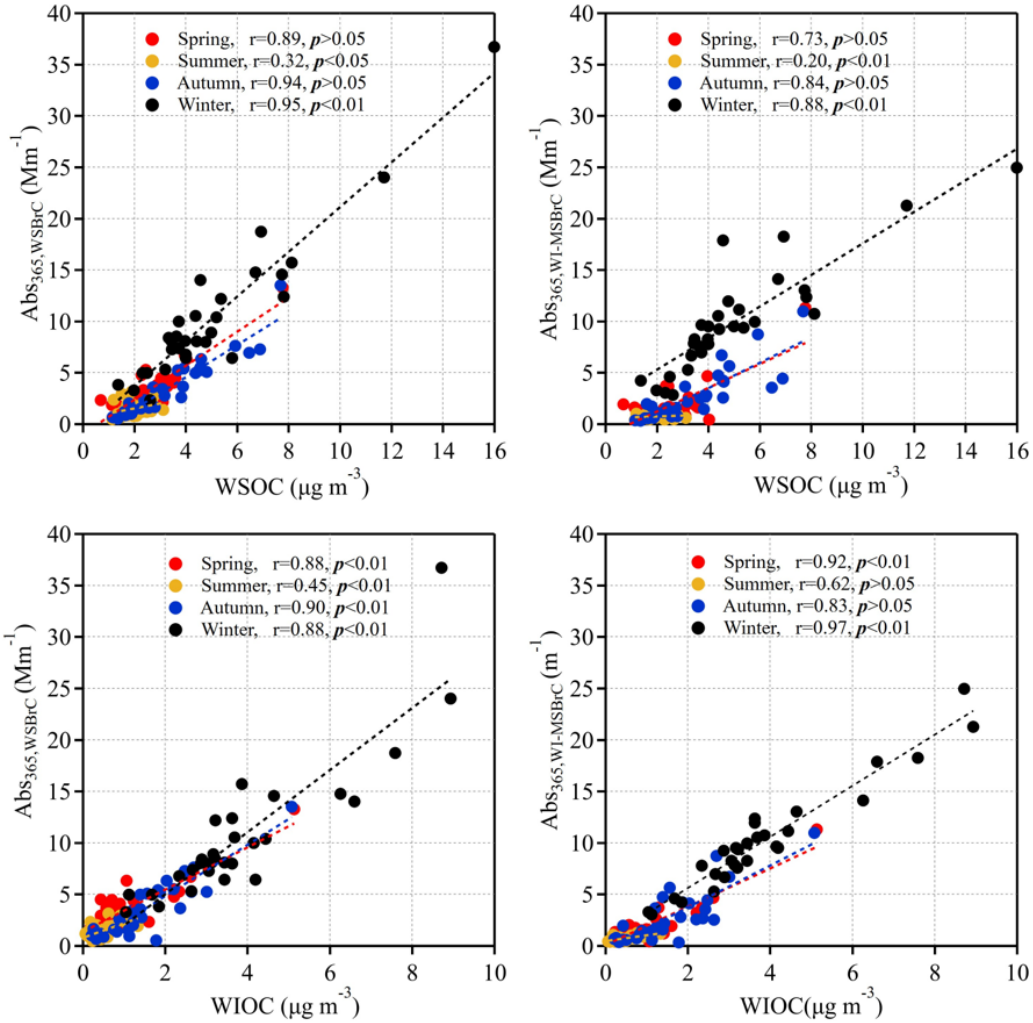

Figure S1. Scatter plots of $Abs_{365(WSBrC)}$ and $Abs_{365(WI\text{-}MSBrC)}$ with the concentration of WSOC and WIOC in $PM_{2.5}$ from Tianjin in each season during 2018–2019. The WSOC and WIOC data is obtained from (Dong et al., 2021).

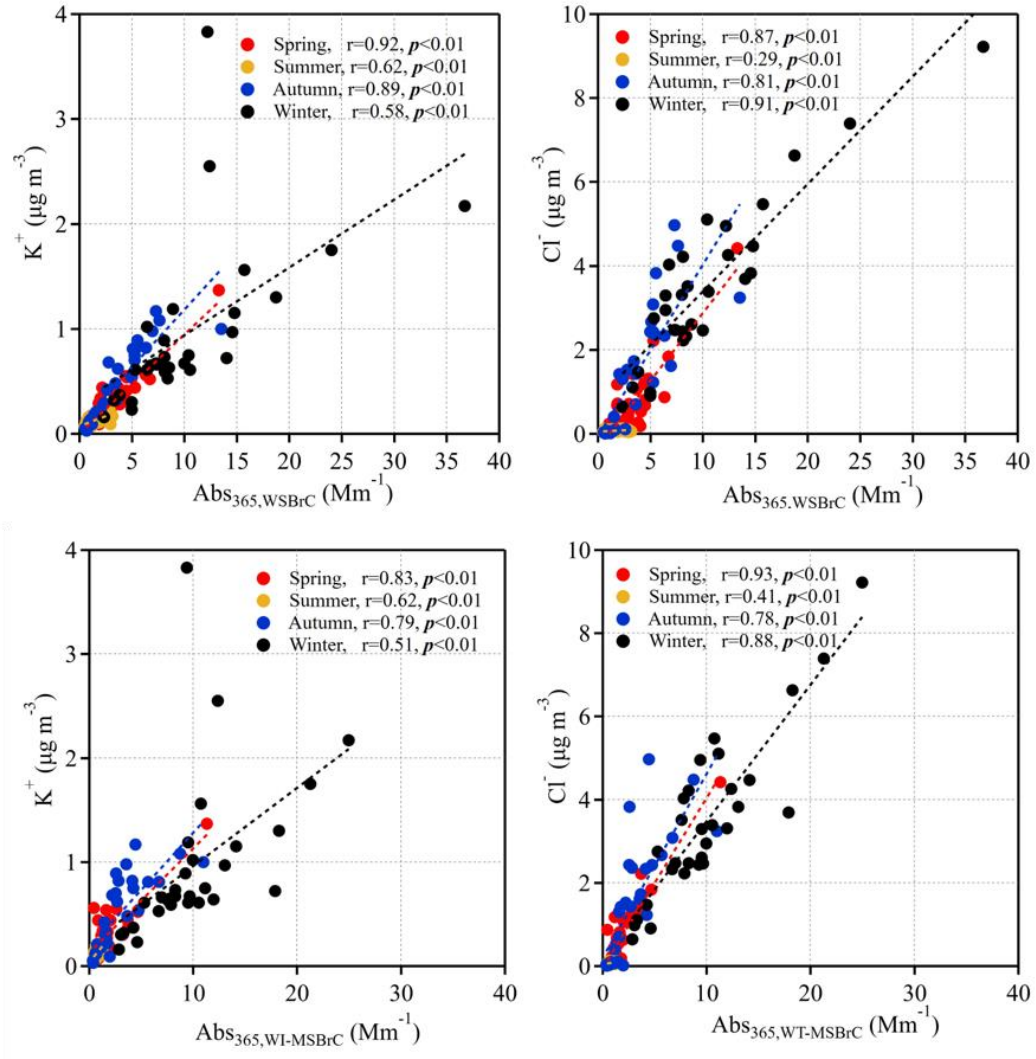

Figure S2. Scatter plots of $Abs_{365(WSBrC)}$ and $Abs_{365(WI\text{-}MSBrC)}$ with K^+ and Cl^- in $PM_{2.5}$ from Tianjin in each season during 2018–2019. The concentration of K^+ and Cl^- from (Dong et al., 2021).

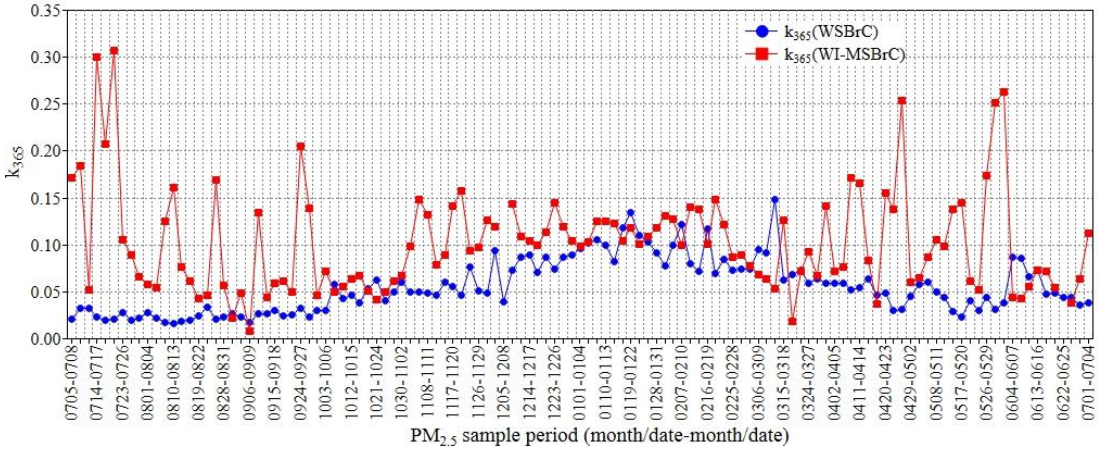

Figure S3. Temporal variations in imaginary refractive index (k) of WSBrC and WI-MSBrC in $PM_{2.5}$ from Tianjin in each season during 2018–2019.

Reference:

Dong, Z. C., Pavuluri, C. M., Xu, Z. J., Wang, Y., Li, P. S., Fu, P. Q., and Liu, C. Q.: Year-round observations of bulk components and ^{13}C and ^{15}N isotope ratios of fine aerosols at Tianjin, North China – Data set, https://doi.org/10.5281/zenodo.5140861, 2021.