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Supplement of

Understanding the mechanism and importance of brown carbon bleaching across the visible spectrum in biomass burning plumes from the WE-CAN campaign

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Table S1: Average values and standard deviation of AMS factor, Mie factor at 660 nm and UHSAS factor for all the integrated plumes when using different particle density and WSOM:WSOC ratio. Unit of particle density is g cm^{-3}.

Factor	Particle Density	WSOM:WSOC	Average	Standard Deviation
	N/A	1.5	1.73	0.79
AMS factor	N/A	1.6	1.63	0.74
	N/A	1.8	1.48	0.79
	1.1	N/A	1.47	0.13
Mie factor at 660 nm	1.4	N/A	1.47	0.13
	1.7	N/A	1.47	0.13
	1.1	N/A	1.83	0.89
Mie factor at 405 nm	1.4	N/A	1.83	0.89
	1.7	N/A	1.83	0.89
	1.1	1.8	1.65	0.82
UHSAS factor	1.4	1.6	2.36	1.17
	1.7	1.5	3.06	1.52

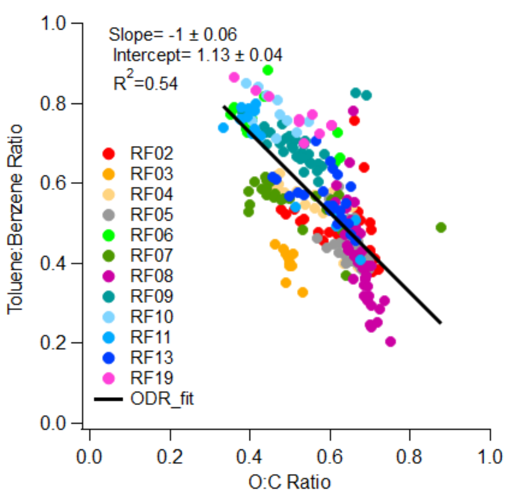

Figure S1: Plume-integrated toluene:benzene ratio variations with the O:C ratio.

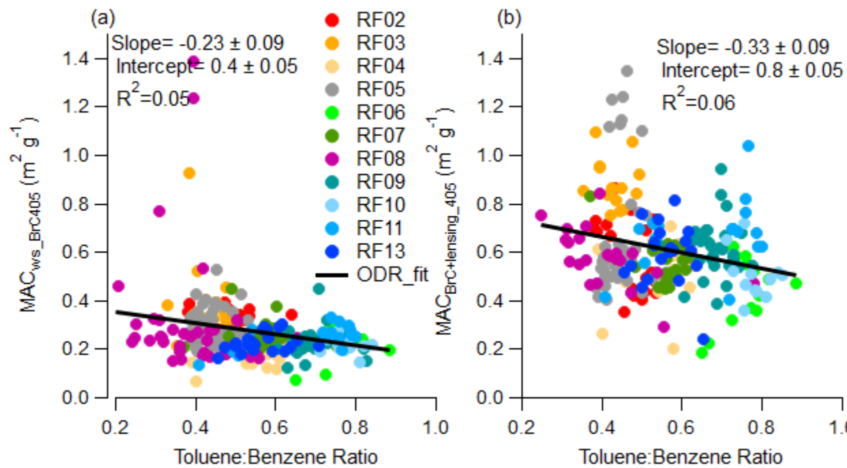

Figure S2: Plume-integrated (a) MAC_{ws_BrC405} and (b)$MAC_{BrC+lensing\_405}$ variations with the toluene:benzene ratio.

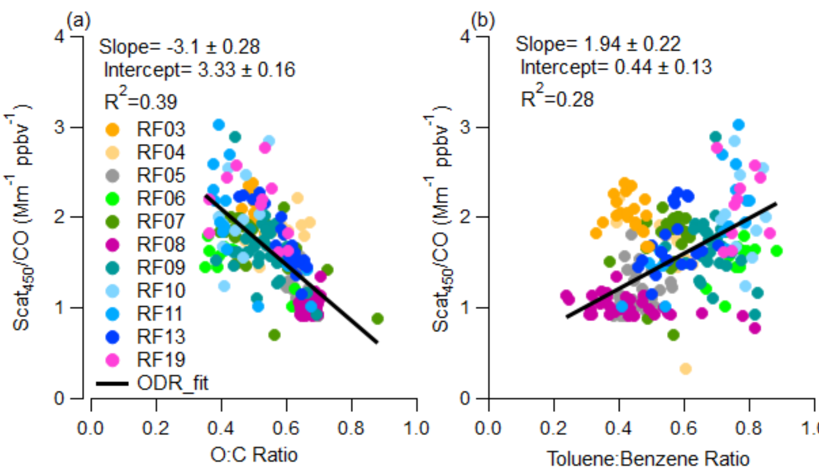

Figure S3: Plume-integrated, CO-normalized scattering coefficient at 450 nm variation with (a) the O:C ratio and (b) toluene:benzene ratio. Data from RF03 were excluded from the ODR fit with toluene:benzene ratio, because RF03 sampled the injection of fresh smoke into the free troposphere, where gas species reacted more rapidly than particles and the toluene:benzene ratio failed to keep track of the aerosol evolution.

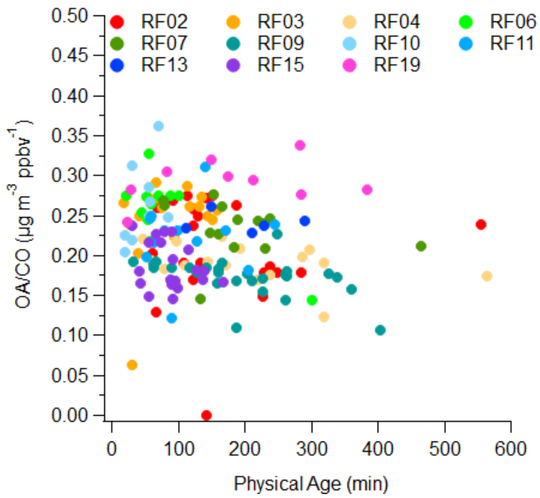

Figure S4: Plume-integrated, CO-normalized OA variation with physical age.

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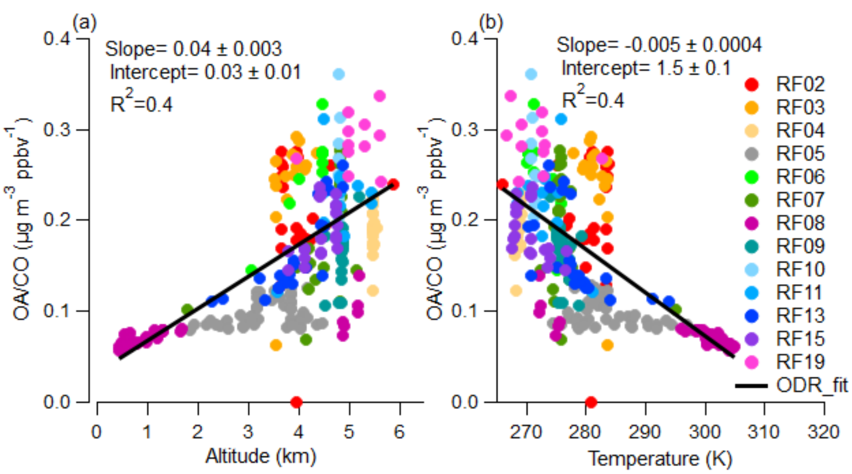

Figure S5: Plume-integrated CO-normalized OA variation with (a) altitude and (b) temperature.

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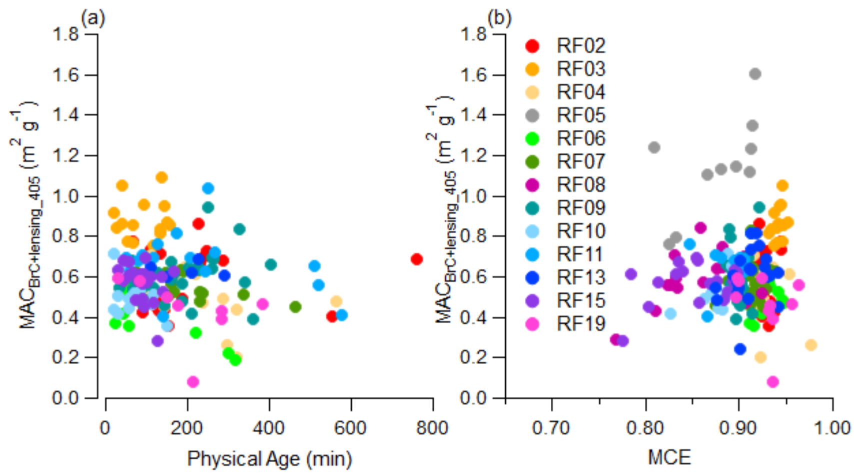

Figure S6: Plume-integrated $MAC_{BrC+lensing\_405}$ variation with (a) physical age and (b) MCE.

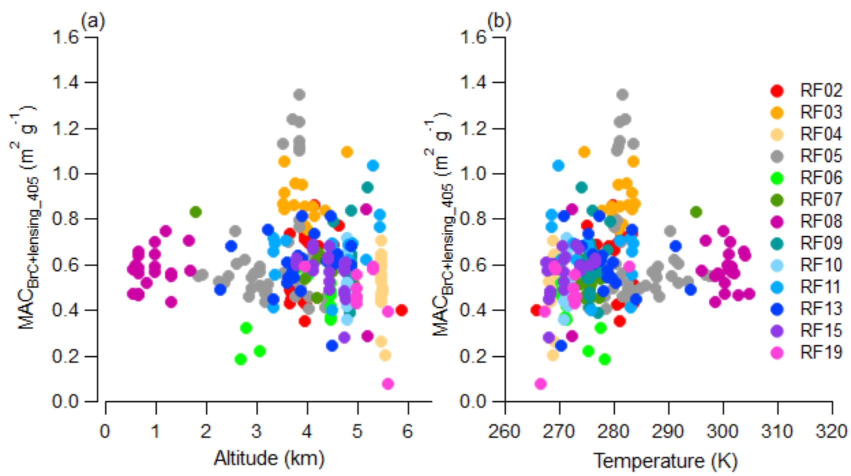

Figure S7: Plume-integrated $MAC_{BrC+lensing\_405}$ variation with (a) altitude and (b) temperature.

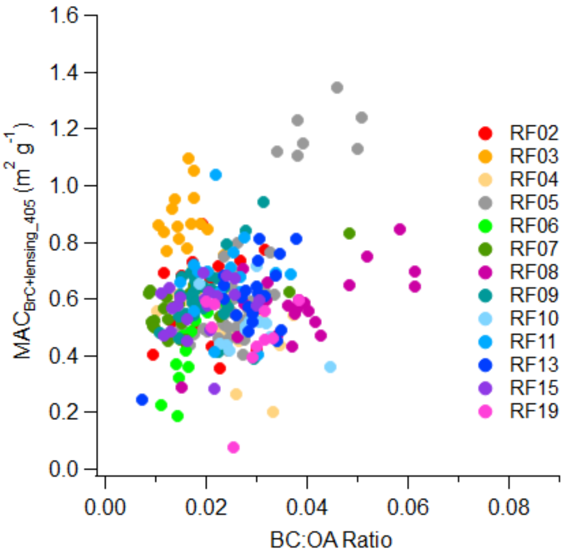

Figure S8: Plume-integrated $MAC_{BrC+lensing\_405}$ variation with the BC:OA ratio.

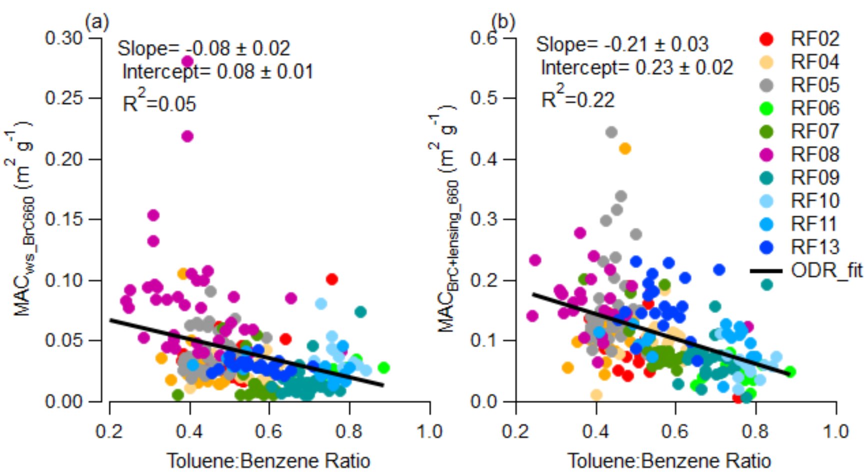

Figure S9: Same as Fig. S1, but at 660 nm.

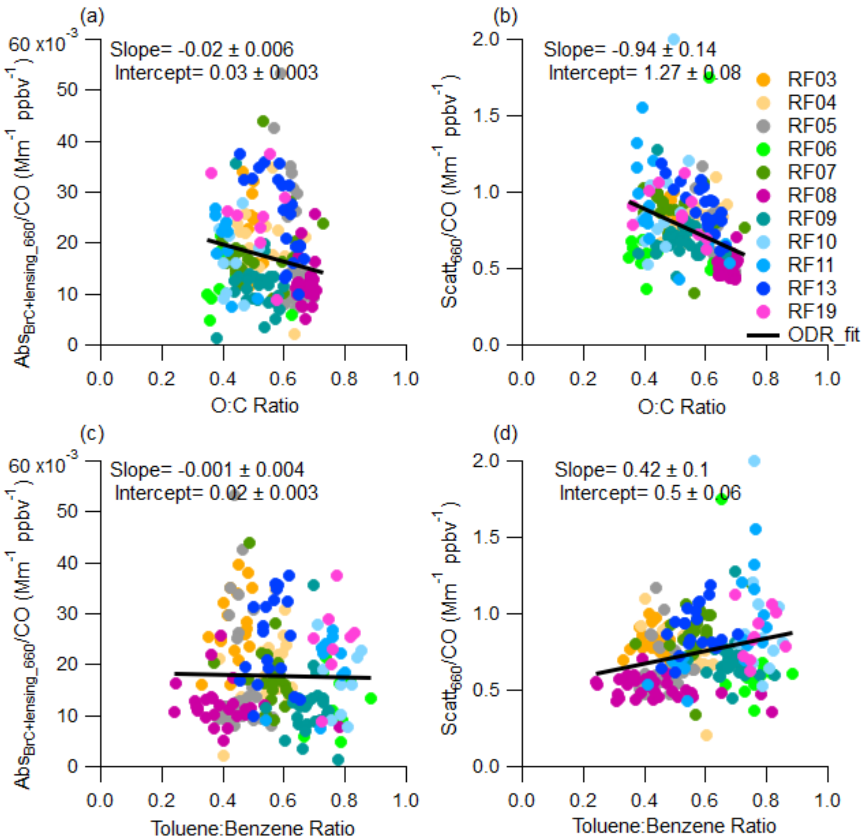

Figure S10: Plume-integrated, CO-normalized $Abs_{BrC+lensing\_660}$, and bulk scattering coefficient for total aerosol at 660 nm variation with chemical age markers. The top panels show the (a) plume-integrated CO-normalized $Abs_{BrC+lensing\_660}$, and (b) plume-integrated CO-normalized total scattering coefficient at 660 nm variation with the O:C ratio. The bottom panels show the (c) plume-integrated CO-normalized $Abs_{BrC+lensing\_660}$, and (d) plume-integrated CO-normalized total scattering at 660 nm variation with the toluene:benzene ratio.

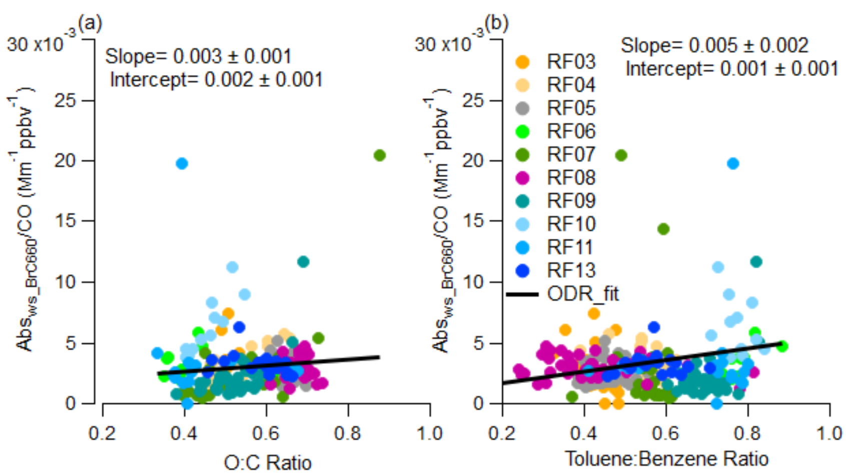

Figure S11: Plume-integrated, CO-normalized Abs_{ws_BrC660} variation with the (a) O:C ratio and (b) toluene:benzene ratio.

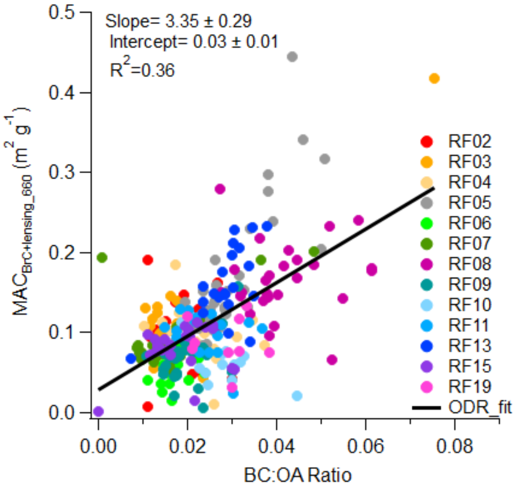

Figure S12: Plume-integrated $MAC_{BrC+lensing\_660}$ variation with BC:OA ratio.

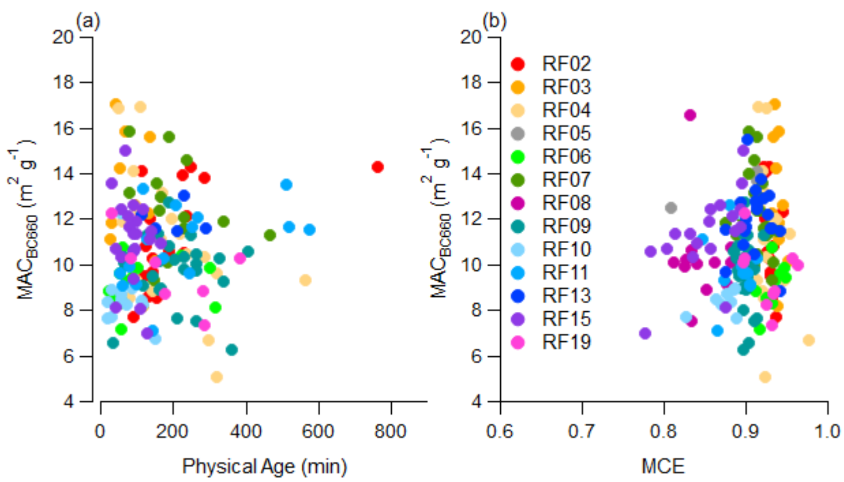

Figure S13: Plume-integrated MAC_{BC660} variation with (a) physical age and (b) MCE.

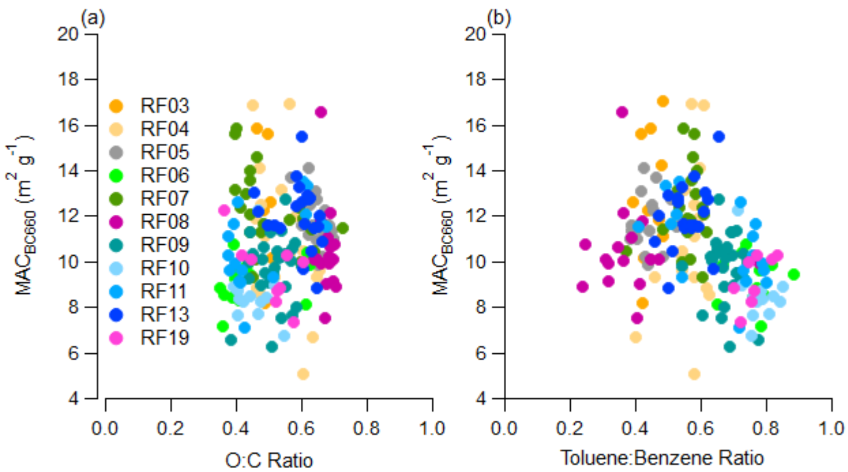

Figure S14: Plume-integrated MAC$_{BC660}$ variation with (a) O:C ratio and (b) toluene:benzene ratio.

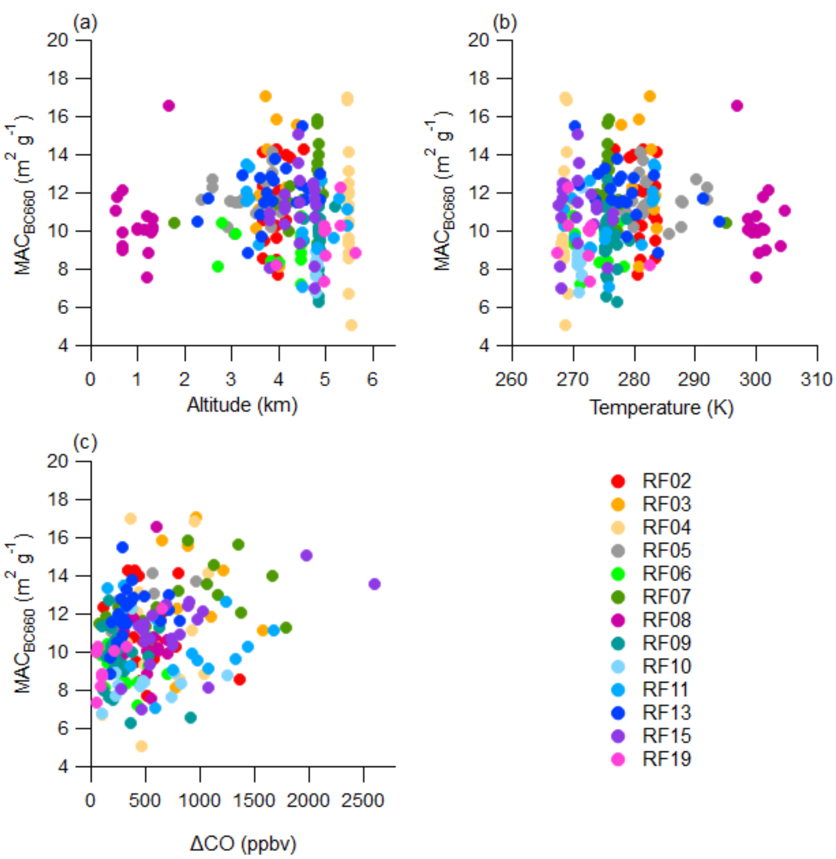

Figure S15: Plume-integrated MAC$_{BC660}$ variation with (a) altitude, (b) temperature, and (c) ΔCO.

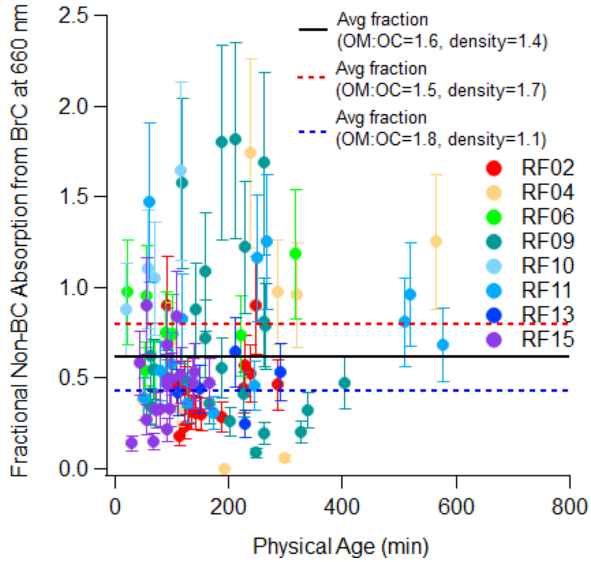

Figure S16: Fraction of non-BC absorption from BrC at 660 nm calculated with UHSAS data and the Mie factor. Markers were calculated using a density of 1.4 g cm^{-3} and a WSOM:WSOC ratio of 1.6. The top whiskers represent sensitivity test values using a density of 1.7 g cm^{-3} and a WSOM:WSOC ratio of 1.5, while the bottom whiskers represent sensitivity test values using a density of 1.1 g cm^{-3} and a WSOM:WSOC ratio of 1.8. The averaged fractions of non-BC absorption from BrC from all the plumes is shown with the black solid line, while the ranges of this average from the sensitivity tests are shown with the red and blue dashed lines.