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Supporting Information for

Effects of Biomass Burning on Stratocumulus Droplet Characteristics, Drizzle Rate, and Composition

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Introduction

The supporting information includes four tables, three figures, and additional references to complement the main manuscript file.

Table S1. Limits of detection of species measured by IC and ICP techniques for cloud water samples.

IC Ions	Limit of Detection (ppm)	ICP Elements	Limit of Detection (ppt)
Cl	0.002	Al	29.47
Na	0.043	K	10.48
SO_4	0.012	Fe	1.19
NO_3	0.009	P	770.73
MSA	0.012	Zn	5.88
Ca	0.045	Mn	1.62
NO_2	0.026	Sr	1.10
NH_4	0.042	Se	82.39
Mg	0.037	Pb	0.503
Oxalate	0.012	Ni	2.84
Adipate	0.023	Cr	1.15
Acetate	0.003	Ba	3.70
Formate	0.074	Cu	1.13
Glycolate	0.054	Cd	4.19
Maleate	0.007	Sn	1.77
Succinate	0.011	Ti	39.05
Pyruvate	0.064	As	7.95
DMA	0.053	Mo	2.26
		Co	0.72
		V	1.35
		Rb	1.57
		Y	0.52
		Zr	1.01
		Ag	0.74
		Cs	0.73
		Nb	0.52
		Si	126.47
		Hf	0.96

Table S2. Average concentration of measured species in cloud water samples during the NiCE campaign. IC species are shown from Cl to dimethylamine (DMA), while IPC elements range from Al to the bottom of the list. N/A in concentration columns indicates no measurement above the limit of detection. N/A in the concentration increase column is placed whenever the percent increase from zero could not be measured.

	Average Concentration (μg m^{-3})		Average Mass Fraction		Concentration Increase	
Species	Non-BB	BB	Non-BB	BB	(μg m^{-3})	Percent (%)
Cl	2.66E-01	1.50E+01	2.22E-01	4.75E-01	1.48E+01	5.54E+03
Na	1.55E-01	8.64E+00	1.29E-01	2.74E-01	8.49E+00	5.46E+03
SO_4	2.53E-01	4.63E-01	2.07E-01	2.08E-02	2.10E-01	8.28E+01
NO_3	2.94E-01	2.81E+00	2.28E-01	9.89E-02	2.52E+00	8.55E+02
MSA	3.44E-02	3.24E-01	2.93E-02	1.19E-02	2.90E-01	8.42E+02
Ca	3.15E-02	1.40E-01	3.00E-02	3.25E-03	1.08E-01	3.44E+02
NO_2	3.25E-02	5.04E-02	2.59E-02	2.39E-03	1.79E-02	5.50E+01
NH_4	2.91E-02	3.17E-01	2.54E-02	1.33E-02	2.88E-01	9.89E+02
Mg	1.48E-03	1.44E-02	1.67E-03	2.95E-04	1.29E-02	8.69E+02
Oxalate	2.20E-02	5.97E-01	1.86E-02	2.23E-02	5.75E-01	2.61E+03
Adipate	1.17E-03	1.26E-01	7.90E-04	4.63E-03	1.25E-01	1.06E+04
Acetate	1.48E-02	3.35E-01	1.13E-02	1.47E-02	3.20E-01	2.16E+03
Formate	2.43E-02	2.99E-01	1.98E-02	1.42E-02	2.74E-01	1.13E+03
Glycolate	2.90E-04	1.46E-01	2.52E-04	5.23E-03	1.46E-01	5.02E+04
Maleate	3.60E-03	8.15E-02	2.95E-03	3.11E-03	7.79E-02	2.17E+03
Succinate	3.51E-03	8.57E-02	2.59E-03	3.93E-03	8.22E-02	2.34E+03
Pyruvate	N/A	6.23E-03	N/A	2.51E-04	1.25E-02	N/A
DMA	N/A	2.64E-02	N/A	9.63E-04	3.02E-02	N/A
Al	1.56E-03	1.62E-02	1.19E-03	5.16E-04	1.46E-02	9.36E+02
K	2.46E-03	5.88E-02	2.48E-03	1.77E-03	5.63E-02	2.29E+03
Fe	2.36E-03	1.28E-02	1.71E-03	4.34E-04	1.04E-02	4.42E+02
I	6.20E-03	1.42E-02	5.10E-03	5.72E-04	8.03E-03	1.30E+02
Zn	2.58E-03	2.47E-03	2.12E-03	9.29E-05	-1.07E-04	-4.14E+00
Mn	9.22E-04	1.07E-02	6.74E-04	2.85E-04	9.79E-03	1.06E+03
Sr	2.69E-04	8.24E-03	2.07E-04	2.53E-04	7.98E-03	2.97E+03
Se	1.43E-04	7.84E-04	1.19E-04	2.92E-05	6.41E-04	4.48E+02
Pb	2.21E-05	1.48E-04	1.62E-05	4.93E-06	1.26E-04	5.69E+02
Ni	1.75E-04	3.14E-04	1.42E-04	1.11E-05	1.39E-04	7.97E+01
Cr	4.89E-05	1.22E-04	3.72E-05	4.14E-06	7.28E-05	1.49E+02
Ba	2.83E-04	3.07E-03	2.17E-04	8.46E-05	2.78E-03	9.84E+02
Cu	3.15E-03	1.51E-03	2.50E-03	5.86E-05	-1.64E-03	-5.20E+01
Cd	6.66E-03	2.18E-03	5.83E-03	9.38E-05	-4.47E-03	-6.72E+01
Sn	1.76E-05	1.64E-05	1.44E-05	6.75E-07	-1.16E-06	-6.60E+00
Ti	2.40E-05	2.42E-04	1.84E-05	1.12E-05	2.18E-04	9.10E+02
As	1.81E-05	1.06E-04	1.50E-05	3.83E-06	8.81E-05	4.87E+02
Mo	9.91E-06	2.05E-05	7.20E-06	7.24E-07	1.06E-05	1.07E+02
Co	1.00E-05	3.64E-05	8.41E-06	1.17E-06	2.64E-05	2.64E+02
V	2.10E-04	5.77E-04	1.64E-04	2.07E-05	3.67E-04	1.75E+02
Rb	9.91E-06	1.22E-04	8.40E-06	3.82E-06	1.12E-04	1.13E+03
Y	N/A	1.41E-05	N/A	4.54E-07	1.61E-05	N/A
Zr	4.13E-06	1.90E-05	3.39E-06	6.62E-07	1.49E-05	3.60E+02
Si	1.27E-02	3.00E-02	9.45E-03	1.02E-03	1.74E-02	1.37E+02

Table S3. Same as Table S2 except for the FASE campaign.

Species	Average Concentration (μg m^{-3})		Average Mass Fraction		Concentration Increase	
	Non-BB	BB	Non-BB	BB	(μg m-3)	Percent (%)
Cl	8.49E-01	2.64E+00	1.37E-01	4.52E-01	1.79E+00	2.11E+02
Na	4.77E-01	1.53E+00	7.72E-02	2.57E-01	1.06E+00	2.22E+02
SO_4	2.45E-01	8.18E-01	7.41E-02	1.51E-01	5.73E-01	2.34E+02
NO_3	5.49E-02	2.61E+00	2.72E-01	4.13E-02	2.55E+00	4.65E+03
MSA	3.84E-02	1.25E-01	1.55E-02	2.39E-02	8.64E-02	2.25E+02
Ca	1.11E-02	2.06E+00	2.38E-01	9.09E-03	2.04E+00	1.84E+04
NO_2	1.10E-02	2.95E-02	2.38E-03	7.63E-03	1.85E-02	1.68E+02
NH_4	7.23E-03	2.45E-01	2.59E-02	3.93E-03	2.37E-01	3.28E+03
Mg	4.24E-03	1.31E-01	1.47E-02	2.49E-03	1.27E-01	3.00E+03
Oxalate	1.31E-02	5.15E-02	3.16E-03	5.74E-03	3.85E-02	2.95E+02
Adipate	7.07E-03	2.04E-02	2.00E-03	5.97E-03	1.33E-02	1.88E+02
Acetate	6.68E-03	2.63E-02	3.05E-03	4.14E-03	1.96E-02	2.94E+02
Formate	3.58E-03	1.92E-02	1.61E-03	2.23E-03	1.56E-02	4.37E+02
Glycolate	3.46E-03	5.22E-02	4.99E-03	2.04E-03	4.88E-02	1.41E+03
Maleate	2.88E-03	3.51E-02	3.53E-03	1.62E-03	3.22E-02	1.12E+03
Succinate	6.57E-05	5.59E-03	6.14E-04	5.75E-05	5.53E-03	8.41E+03
Al	2.06E-02	1.76E-01	1.70E-02	1.60E-02	1.55E-01	7.54E+02
K	N/A	1.81E-01	N/A	1.66E-02	1.81E-01	N/A
Fe	4.85E-03	9.66E-02	9.30E-03	3.44E-03	9.18E-02	1.89E+03
P	3.96E-03	1.14E-01	1.04E-02	3.11E-03	1.10E-01	2.77E+03
I	1.36E-03	7.32E-03	9.77E-04	9.53E-04	5.96E-03	4.38E+02
Zn	6.23E-04	3.49E-03	3.81E-04	5.31E-04	2.86E-03	4.59E+02
Mn	4.98E-04	2.00E-02	2.10E-03	3.54E-04	1.95E-02	3.92E+03
Sr	4.46E-04	2.86E-02	3.02E-03	2.63E-04	2.82E-02	6.32E+03
Se	2.10E-04	2.34E-04	2.23E-05	1.33E-04	2.43E-05	1.16E+01
Pb	2.00E-04	3.77E-04	3.65E-05	1.53E-04	1.77E-04	8.87E+01
Ni	1.84E-04	3.82E-03	5.38E-04	1.74E-04	3.64E-03	1.98E+03
Cr	1.62E-04	1.51E-03	1.95E-04	1.31E-04	1.35E-03	8.32E+02
Ba	1.54E-04	1.75E-02	1.96E-03	1.21E-04	1.73E-02	1.13E+04
Cu	1.34E-04	1.32E-03	1.49E-04	1.17E-04	1.19E-03	8.86E+02
Cd	1.05E-04	2.15E-04	3.16E-05	9.56E-05	1.09E-04	1.04E+02
Sn	1.00E-04	7.90E-05	9.68E-06	7.25E-05	-2.14E-05	-2.13E+01
Ti	9.88E-05	3.01E-03	2.97E-04	6.08E-05	2.91E-03	2.94E+03
As	2.45E-05	1.08E-04	9.83E-06	1.75E-05	8.38E-05	3.43E+02
Mo	2.38E-05	3.17E-04	3.11E-05	2.23E-05	2.93E-04	1.23E+03
Co	2.35E-05	1.73E-04	1.83E-05	1.98E-05	1.49E-04	6.36E+02
V	1.91E-05	4.90E-04	4.79E-05	1.22E-05	4.71E-04	2.46E+03
Rb	1.27E-05	4.43E-04	4.25E-05	7.93E-06	4.30E-04	3.40E+03
Y	6.08E-06	1.80E-04	1.74E-05	3.81E-06	1.74E-04	2.86E+03
Zr	3.37E-06	3.38E-05	3.27E-06	2.03E-06	3.05E-05	9.03E+02
Ag	1.03E-06	2.48E-06	2.67E-07	7.60E-07	1.45E-06	1.40E+02
Cs	2.66E-07	9.50E-06	9.46E-07	1.22E-07	9.24E-06	3.47E+03
Nb	2.16E-07	4.88E-06	5.35E-07	1.56E-07	4.67E-06	2.16E+03
Si	N/A	6.84E-01	N/A	5.97E-02	6.84E-01	N/A
Hf	N/A	1.01E-06	N/A	9.07E-08	1.01E-06	N/A

Table S4. Average concentration of the species contributing to the slice denoted as "Rest" in panels (c) and (d) from Figures 7 and 8.

Figure 7				Figure 8			
Panel (c)		Panel (d)		Panel (c)		Panel (d)	
Species	Concentration (µg m^{-3})	Species	Concentration (µg m^{-3})	Species	Concentration (µg m^{-3})	Species	Concentration (µg m^{-3})
Cd	5.83E-03	B	5.16E-04	B	7.66E-04	Ni	5.38E-04
Cu	2.50E-03	Cd	9.38E-05	Zn	5.31E-04	B	4.07E-04
Zn	2.12E-03	Zn	9.29E-05	Ni	1.74E-04	Zn	3.81E-04
B	1.60E-03	Cu	5.86E-05	Pb	1.53E-04	Ti	2.97E-04
V	1.64E-04	Se	2.92E-05	Se	1.33E-04	Cr	1.95E-04
Ni	1.42E-04	V	2.07E-05	Cr	1.31E-04	Cu	1.49E-04
Se	1.19E-04	Ti	1.12E-05	Cu	1.17E-04	V	4.79E-05
Cr	3.72E-05	Ni	1.11E-05	Cd	9.56E-05	Rb	4.25E-05
Ga	2.56E-05	Ga	9.18E-06	Sn	7.25E-05	Pb	3.65E-05
Ti	1.84E-05	Pb	4.93E-06	Ti	6.08E-05	Cd	3.16E-05
Pb	1.62E-05	Cr	4.14E-06	Mo	2.23E-05	Mo	3.11E-05
As	1.50E-05	As	3.83E-06	Co	1.98E-05	Se	2.23E-05
Sn	1.44E-05	Rb	3.82E-06	As	1.75E-05	Co	1.83E-05
Co	8.41E-06	Co	1.17E-06	V	1.22E-05	Y	1.74E-05
Sb	8.40E-06	Sb	1.15E-06	Rb	7.93E-06	As	9.83E-06
Rb	8.40E-06	Mo	7.24E-07	Y	3.81E-06	Sn	9.68E-06
Mo	7.20E-06	Sn	6.75E-07	Zr	2.03E-06	Li	4.16E-06
Zr	3.39E-06	Zr	6.62E-07	Ag	7.60E-07	Zr	3.27E-06
				Nb	1.56E-07	Be	1.35E-06
				Cs	1.22E-07	Cs	9.46E-07
						Pd	6.55E-07
						Nb	5.35E-07
						Ag	2.67E-07
						Hg	1.30E-07
						Hf	9.07E-08
						Rh	1.22E-08
						Ta	7.08E-09

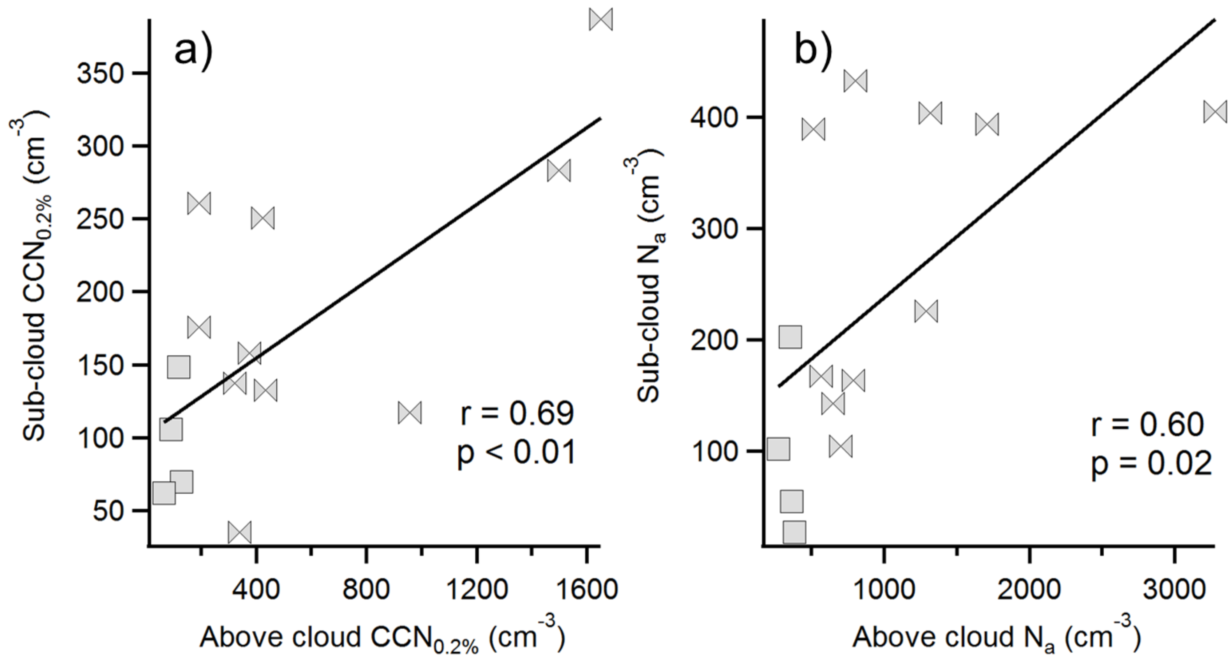

Figure S1. The relationship between the average (a) $CCN_{0.2\%}$ concentration below and above cloud, and (b) the same for average aerosol concentration (N_a). Square and bowtie markers are for FASE and NiCE, respectively.

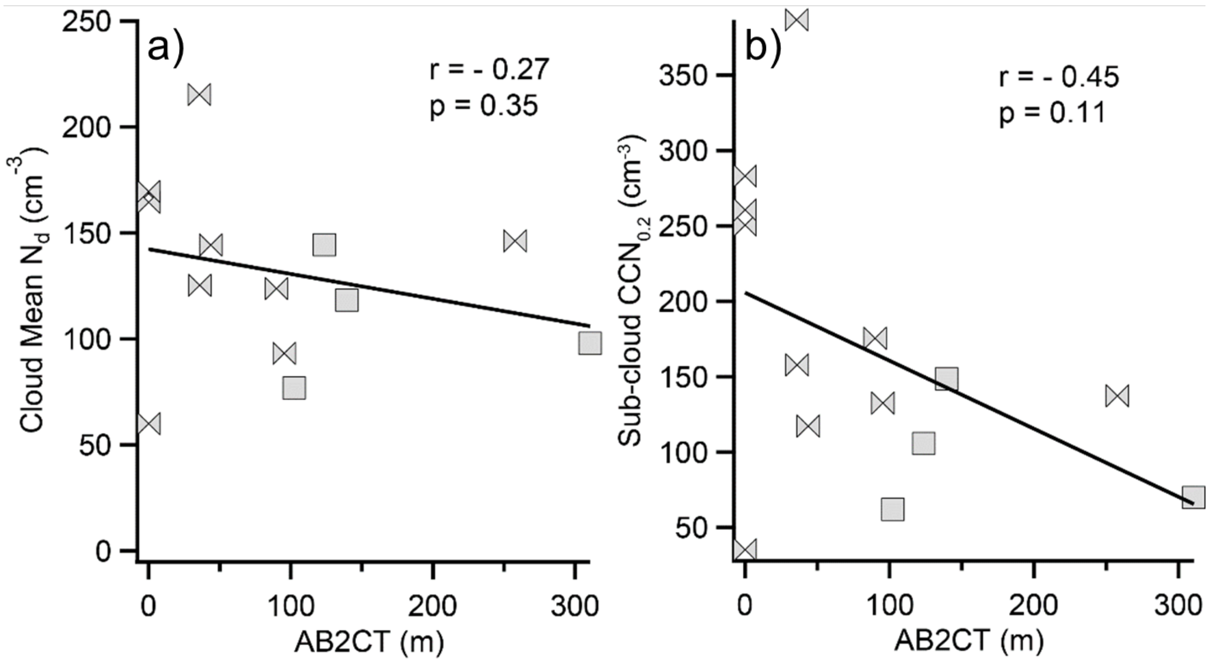

Figure S2. (a) The relationship between cloud layer-mean N_d and the distance between cloud top and the base of a BB layer, commonly referred to as AB2CT (i.e., Rajapakshe et al., 2017). (b) Same as (a) except with sub-cloud $CCN_{0.2\%}$ on y-axis. Square and bowtie markers are for FASE and NiCE, respectively.

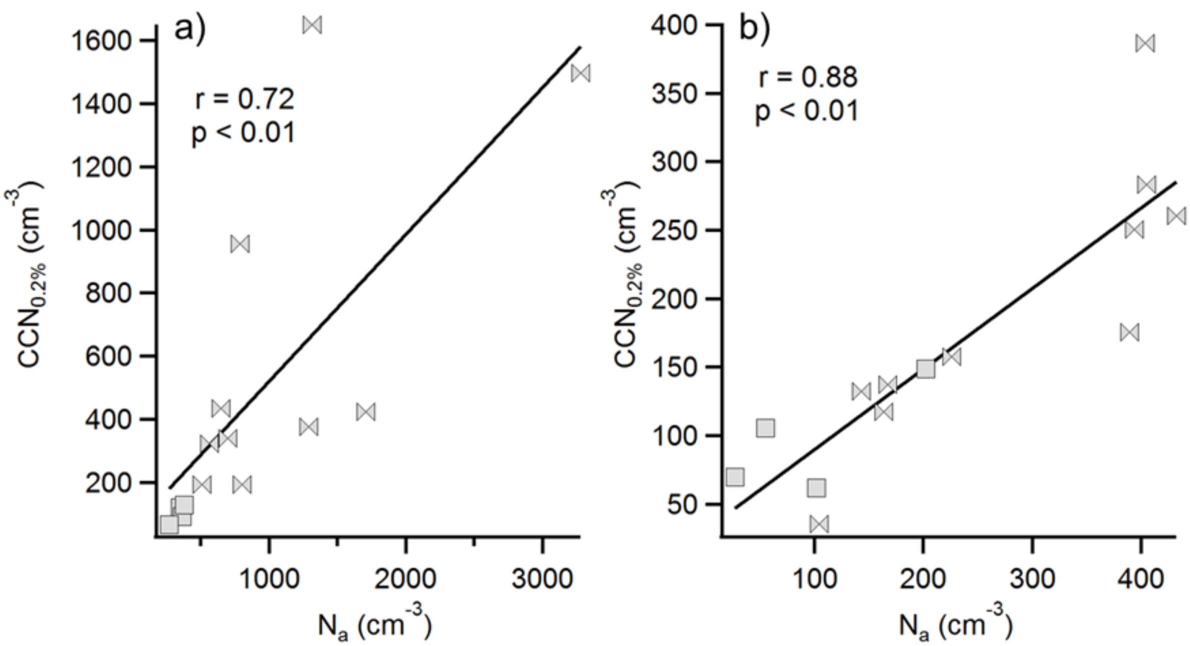

Figure S3. Relationship between $CCN_{0.2\%}$ and N_a (a) above cloud or (b) below cloud. Square and bowtie markers are for FASE and NiCE, respectively.

References

Rajapakshe, C., Zhang, Z., Yorks, J. E., Yu, H., Tan, Q., Meyer, K., et al. (2017). Seasonally transported aerosol layers over southeast Atlantic are closer to underlying clouds than previously reported. *Geophysical Research Letters*, 44(11), 5818–5825. https://doi.org/10.1002/2017GL073559