Atmospheric
Chemistry
and Physics

Supplement of

On the relationship between cloud water composition and cloud droplet number concentration

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9   **Table S1.** Limits of detection (LOD) for the species that were measured in this study. IC = Ion
10   Chromatography, ICP = ICP-MS or ICP-QQQ.

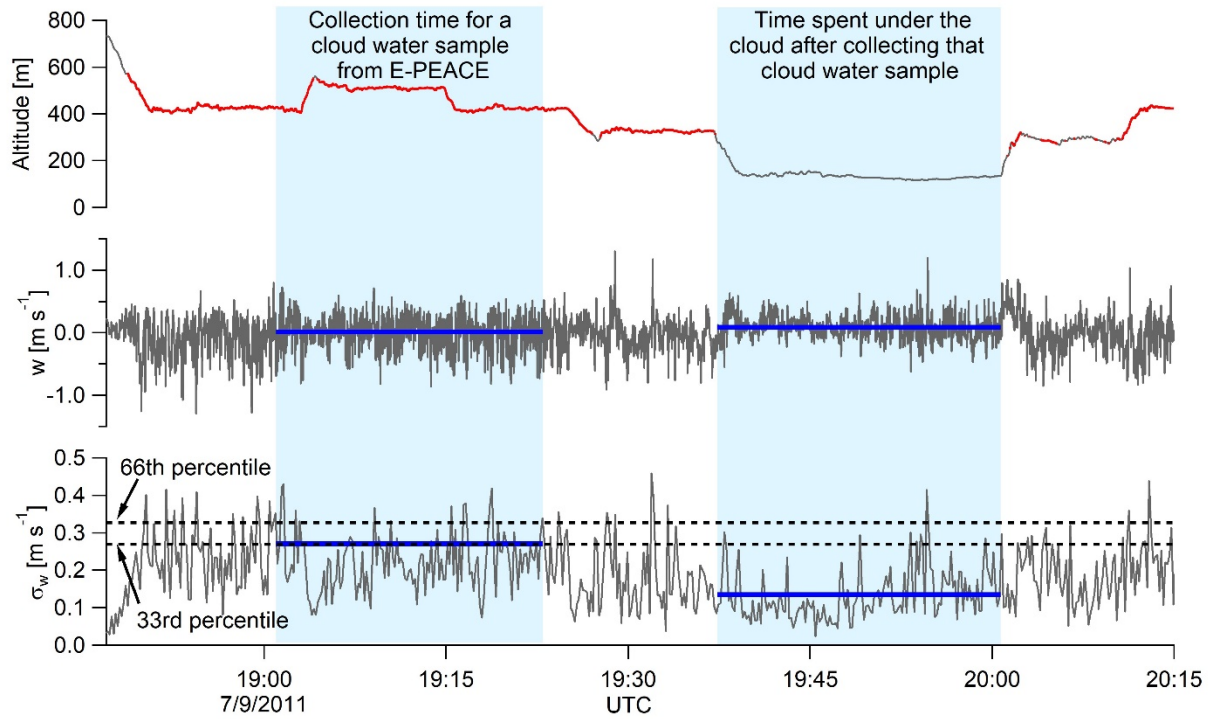| Elements (ICP)	LOD (ppt)	Inorganic ions (IC)	LOD (ppm)
Ag	0.74	Ammonium (NH_4^+)	0.0424
Al	29.47	Bromide (Br^-)	0.0251
As	7.95	Calcium (Ca^{2+})	0.0452
B	361.83	Chloride (Cl^-)	0.0021
Ba	3.70	Fluoride (F^-)	[a]
Br	[a]	Lithium (Li^+)	0.0349
C	[a]	Magnesium (Mg^{2+})	0.0369
Ca	543.10	Methanesulfonic acid (MSA)	0.0123
Cd	4.19	Nitrate (NO_3^-)	0.0089
Cl	[a]	Nitrite (NO_2^-)	0.0262
Co	0.72	Potassium (K^+)	0.0262
Cr	1.15	Sodium (Na^+)	0.0435
Cs	0.73	Sulfate (SO_4^{2-})	0.0120
Cu	1.13		
Fe	1.19		
Ga	[a]	Organic ions (IC)	LOD (ppm)
Hf	0.96	Acetate	0.0027
I	[a]	Adipate	0.0227
K	10.48	Butyrate	[a]
Li	103.65	Formate	0.0742
Mg	14.38	Glutarate	0.0063
Mn	1.62	Glycolate	0.0536
Mo	2.26	Glyoxylate	0.9448
Na	7.74	Lactate	[a]
Nb	0.52	Maleate	0.0070
Ni	2.84	Malonate	0.3915
P	770.73	Oxalate	0.0123
Pb	0.50	Propionate	[a]
Pd	1.68	Pyruvate	0.0638
Rb	1.57	Succinate	0.0110
Rh	[a]		
Ru	1.44		
S	5823.00	Amines (IC)	LOD (ppm)
Sb	[a]	Diethylamine (DEA)[b]	0.3152
Se	82.39	Dimethylamine (DMA)	0.0527
Si	126.47		
Sn	1.77		
Sr	1.10		
Ta	0.20		
Te	65.46		
Ti	39.05		
V	1.35		
W	[a]		
Y	0.5230		
Zn	5.8800		
Zr	1.0080		

[a] LODs were not available for these species.

[b] DEA co-elutes with Trimethylamine (TMA), so this LOD is an overestimate.

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12   **Table S2.** Summary of the number of regressions that were statistically significant in Figure 4. A
13   regression was considered statistical significance if all the p-values for a regression were < 0.05.
14   There is a p-value associated to the overall regression, to each predictor, and to the intercept.

# of predictors	# of regressions	% of regressions that are statistically significant
1	9	100
2	35	66
3	77	22
4	105	10
5	91	8
6	49	0
7	15	0
8	2	0

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	MSA	NH_4^+	NO_3^-	Ox	Tot-SO_4^{2-}	NSS-SO_4^{2-}	Na	Fe	V
MSA	1								
NH_4^+	0.36	1							
NO_3^-	0.42	0.48	1						
Ox	0.51	0.55	0.39	1					
Tot-SO_4^{2-}	0.50	0.42	0.43	0.20	1				
NSS-SO_4^{2-}	0.18	0.26	0.36	0.08	0.60	1			
Na	0.35	0.20	0.12	0.13	0.53	0.05	1		
Fe	0.20	0.14	0.22	0.23	0.07	0.02	0.03	1	
V	0.07	0.27	0.49	0.04	0.28	0.48	0.03	0.04	1
	MSA	NH_4^+	NO_3^-	Ox	Tot-SO_4^{2-}	NSS-SO_4^{2-}	Na	Fe	V

Figure S2. Correlation matrix of R^2_{adj} for the nine filtered species used to predict cloud droplet number concentration (N_d). All values are statistically significant (p-value < 0.05). The cells are color coded to highlight low values (red) and high values (green).
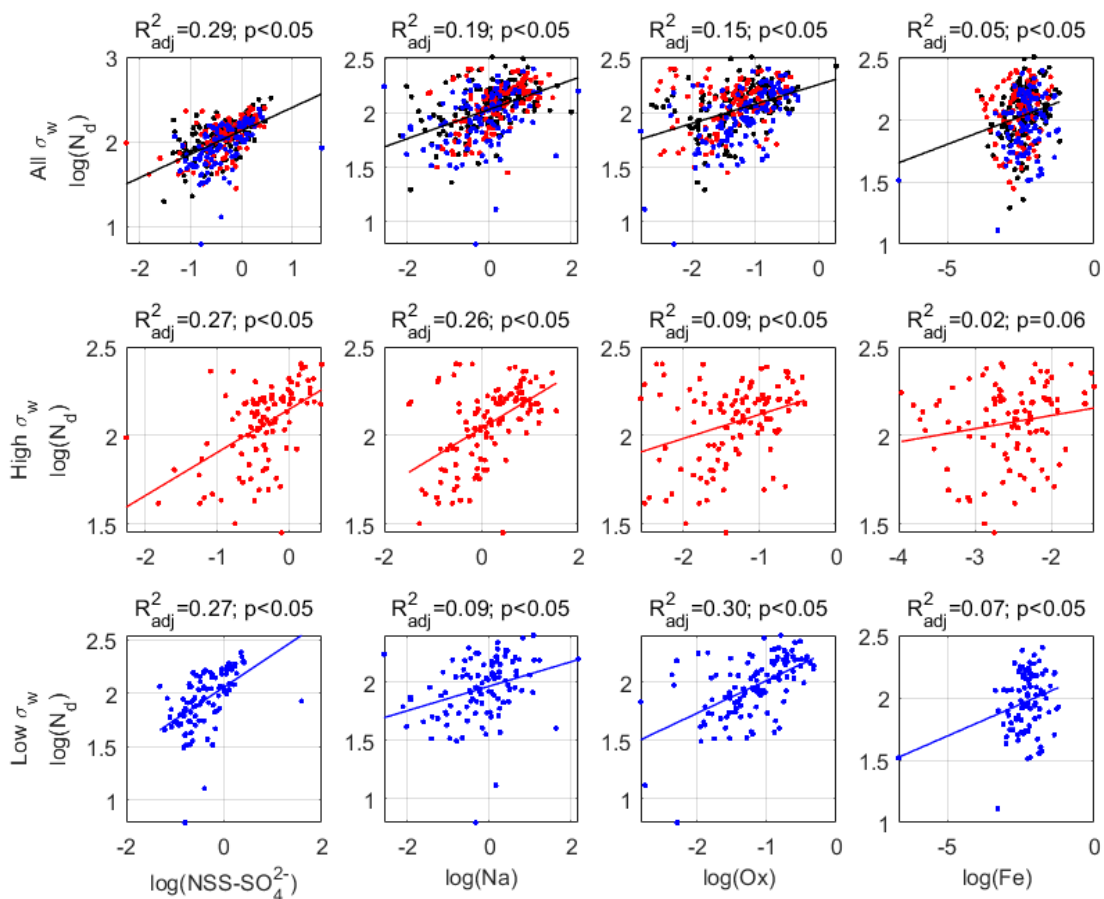
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31 **Figure S3.** Scatterplots of four selected species when binning by σ_w. These four species were
32 selected owing to their ability to represent distinct aerosol sources in the study region. Red: top
33 33rd percentile ($\sigma_w \geq 0.33$ m s^{-1}); Blue: bottom 33rd percentile ($\sigma_w \leq 0.27$ m s^{-1}); Black: between
34 bottom and top percentiles (0.27 m s$^{-1} \leq \sigma_w \leq 0.33$ m s^{-1}).
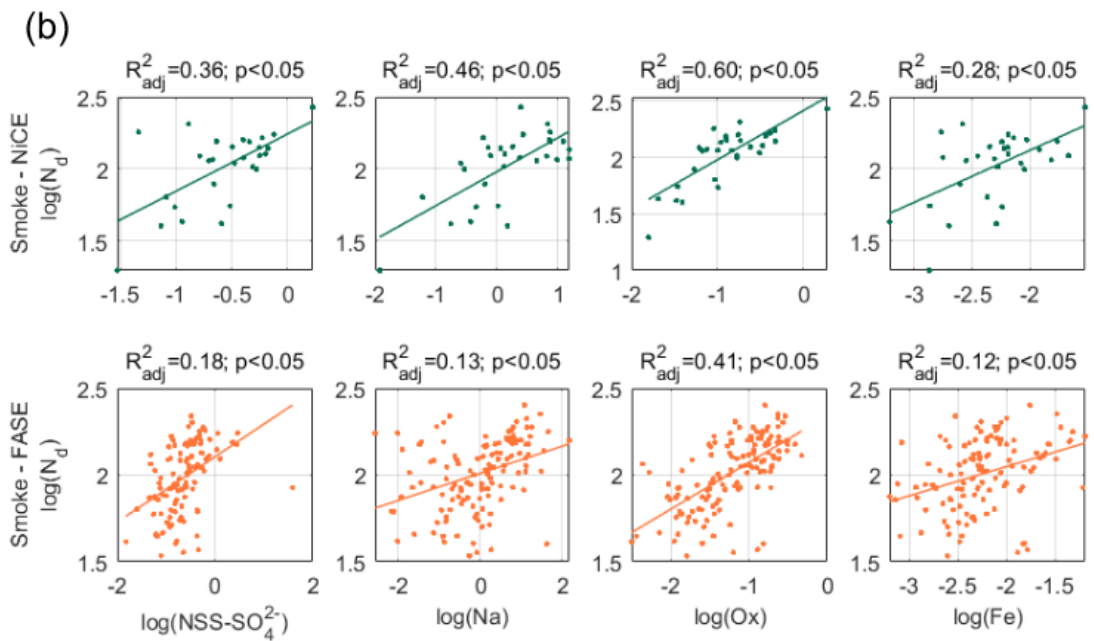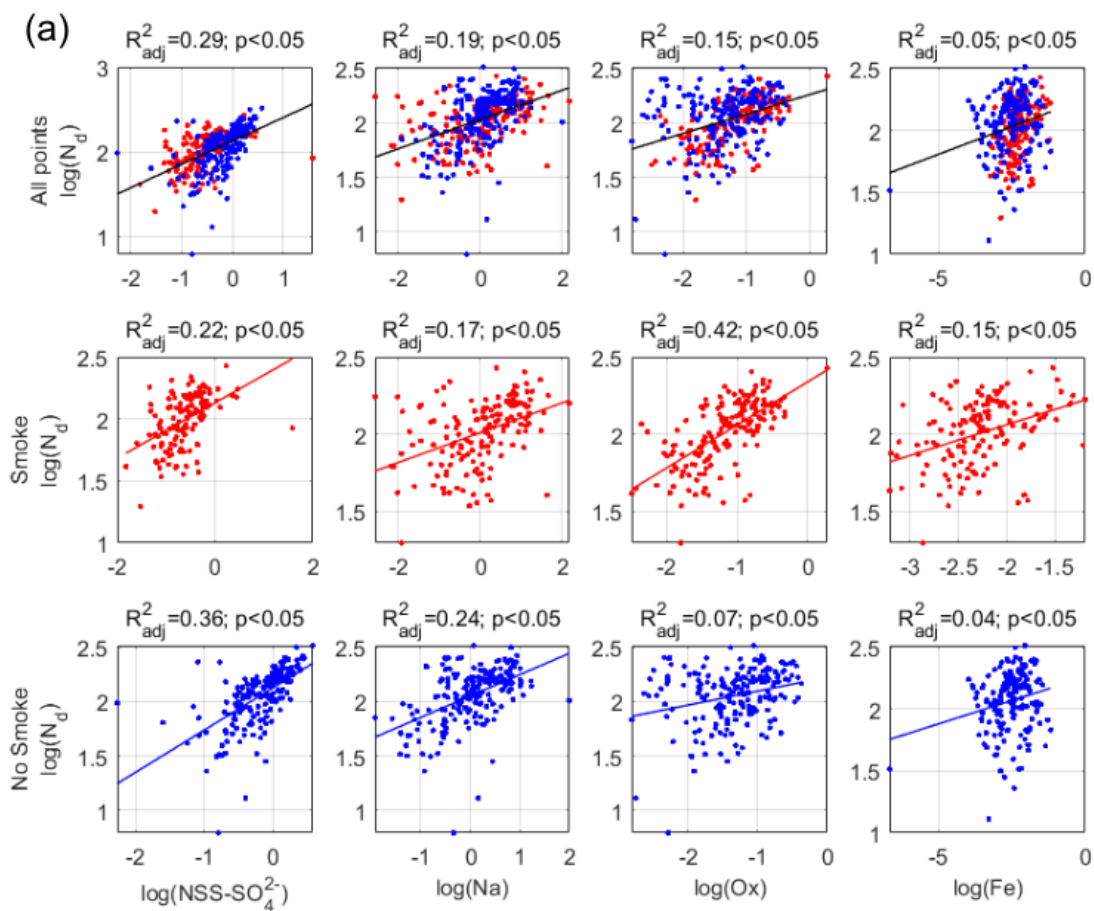
Figure S4. Scatterplots of four selected species when binning by smoke influence. (a) The NiCE (2015) and FASE (2016) campaigns are considered together. Black: Smoke-influence and no-

38   smoke influence combined; Red: smoke influence; Blue: no smoke influence. (b) The NiCE and
39   FASE campaigns are considered separately. Green: NiCE; Orange: FASE.
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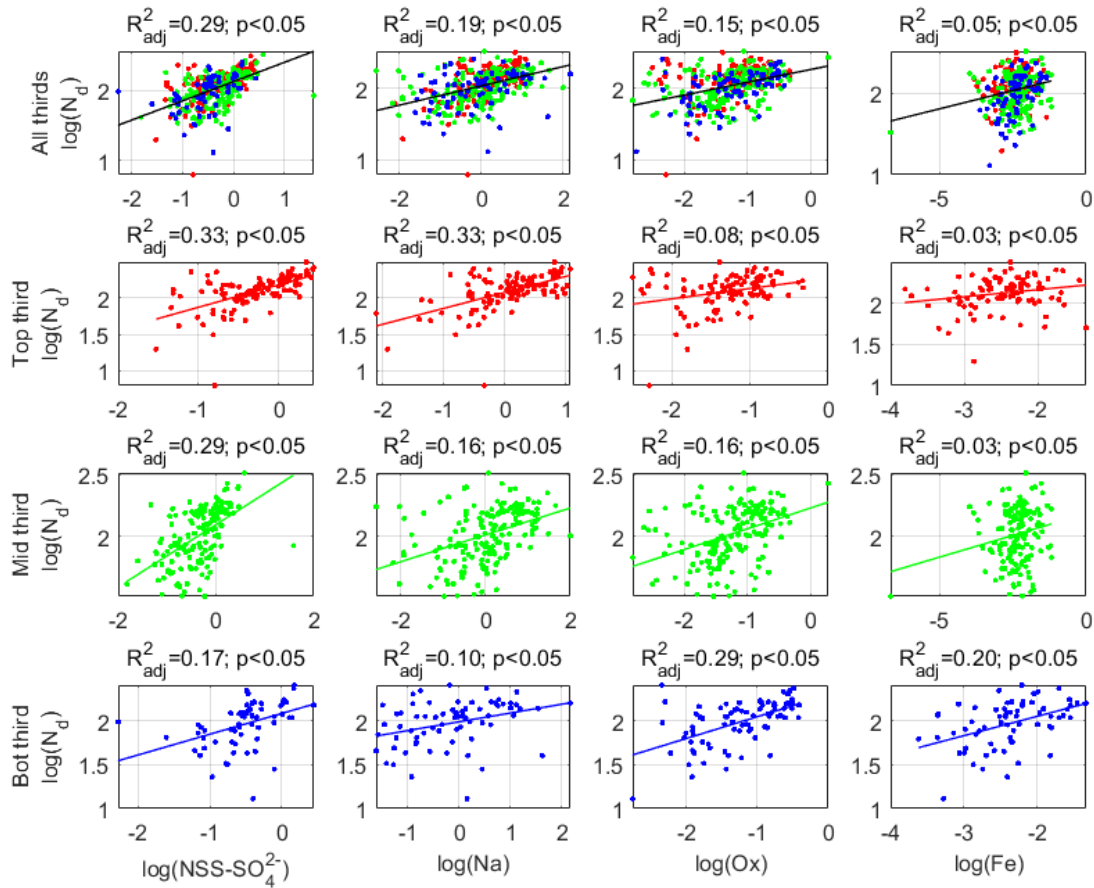
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44 **Figure S5.** Scatterplots of four selected species when binning by normalized in-cloud height.
45 Red: top third; Green: mid third; Blue: bottom third.