

1 *Supplement of*  
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3 **On the Relationship Between Cloud Water Composition and Cloud Droplet Number**  
4 **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 <sub>4</sub> <sup>+</sup> )	0.0424
Al	29.47	Bromide (Br <sup>-</sup> )	0.0251
As	7.95	Calcium (Ca <sup>2+</sup> )	0.0452
B	361.83	Chloride (Cl <sup>-</sup> )	0.0021
Ba	3.70	Fluoride (F <sup>-</sup> )	<sup>a</sup>
Br	<sup>a</sup>	Lithium (Li <sup>+</sup> )	0.0349
C	<sup>a</sup>	Magnesium (Mg <sup>2+</sup> )	0.0369
Ca	543.10	Methanesulfonic acid (MSA)	0.0123
Cd	4.19	Nitrate (NO <sub>3</sub> <sup>-</sup> )	0.0089
Cl	<sup>a</sup>	Nitrite (NO <sub>2</sub> <sup>-</sup> )	0.0262
Co	0.72	Potassium (K <sup>+</sup> )	0.0262
Cr	1.15	Sodium (Na <sup>+</sup> )	0.0435
Cs	0.73	Sulfate (SO <sub>4</sub> <sup>2-</sup> )	0.0120
Cu	1.13		
Fe	1.19		
Ga	<sup>a</sup>	<u>Organic ions (IC)</u>	<u>LOD (ppm)</u>
Hf	0.96	Acetate	0.0027
I	<sup>a</sup>	Adipate	0.0227
K	10.48	Butyrate	<sup>a</sup>
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	<sup>a</sup>
Nb	0.52	Maleate	0.0070
Ni	2.84	Malonate	0.3915
P	770.73	Oxalate	0.0123
Pb	0.50	Propionate	<sup>a</sup>
Pd	1.68	Pyruvate	0.0638
Rb	1.57	<u>Succinate</u>	<u>0.0110</u>
Rh	<sup>a</sup>		
Ru	1.44		
S	5823.00	<u>Amines (IC)</u>	<u>LOD (ppm)</u>
Sb	<sup>a</sup>	Diethylamine (DEA) <sup>b</sup>	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	<sup>a</sup>		
Y	0.5230		
Zn	5.8800		
Zr	1.0080		

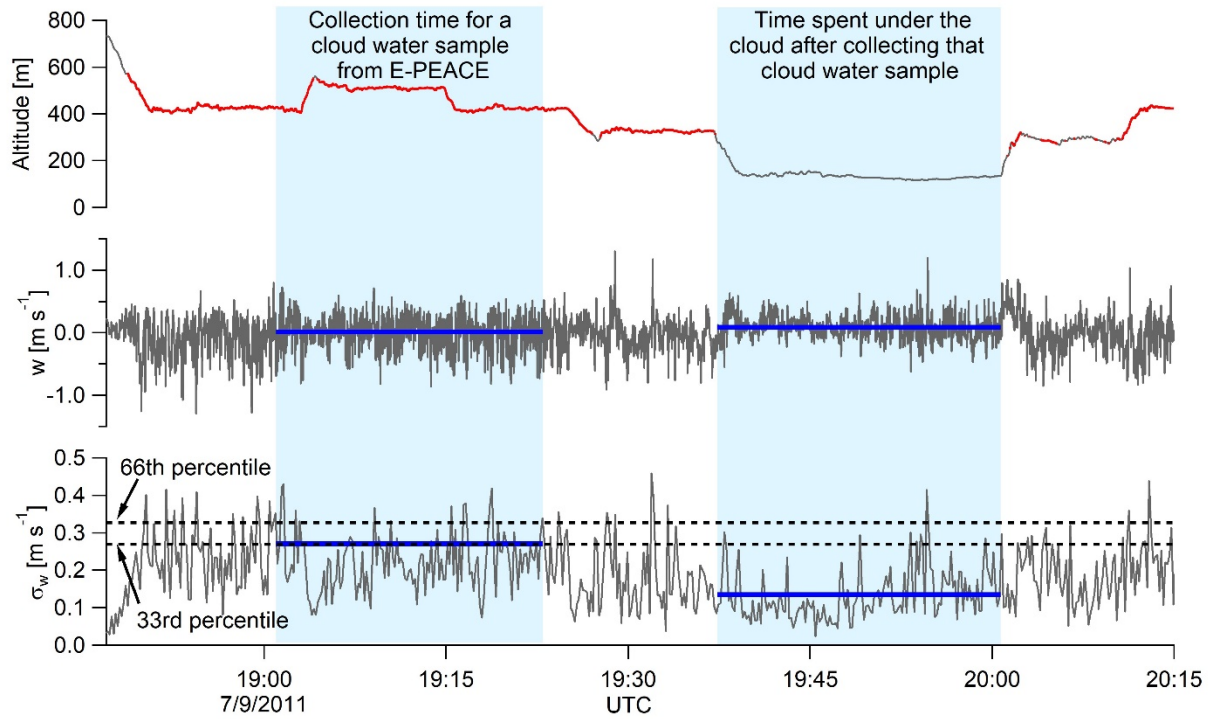
<sup>a</sup> LODs were not available for these species.

<sup>b</sup> DEA co-elutes with Trimethylamine (TMA), so this LOD is an overestimate.

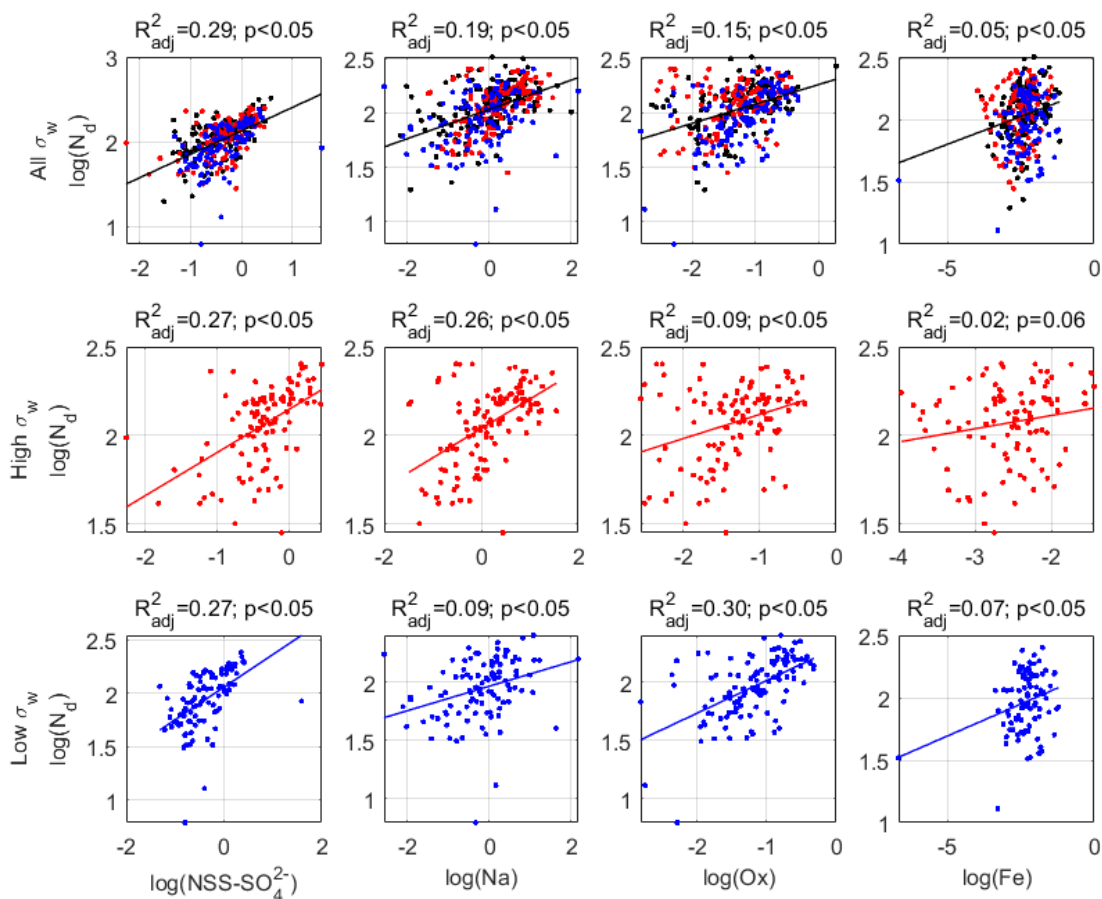
12 **Table S2.** Summary of the number of regressions that were statistically significant in Figure 4. A  
 13 regression was considered statistical significance if all the p-values for a regression were < 0.05.  
 14 There is a p-value associated to the overall regression, to each predictor, and to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

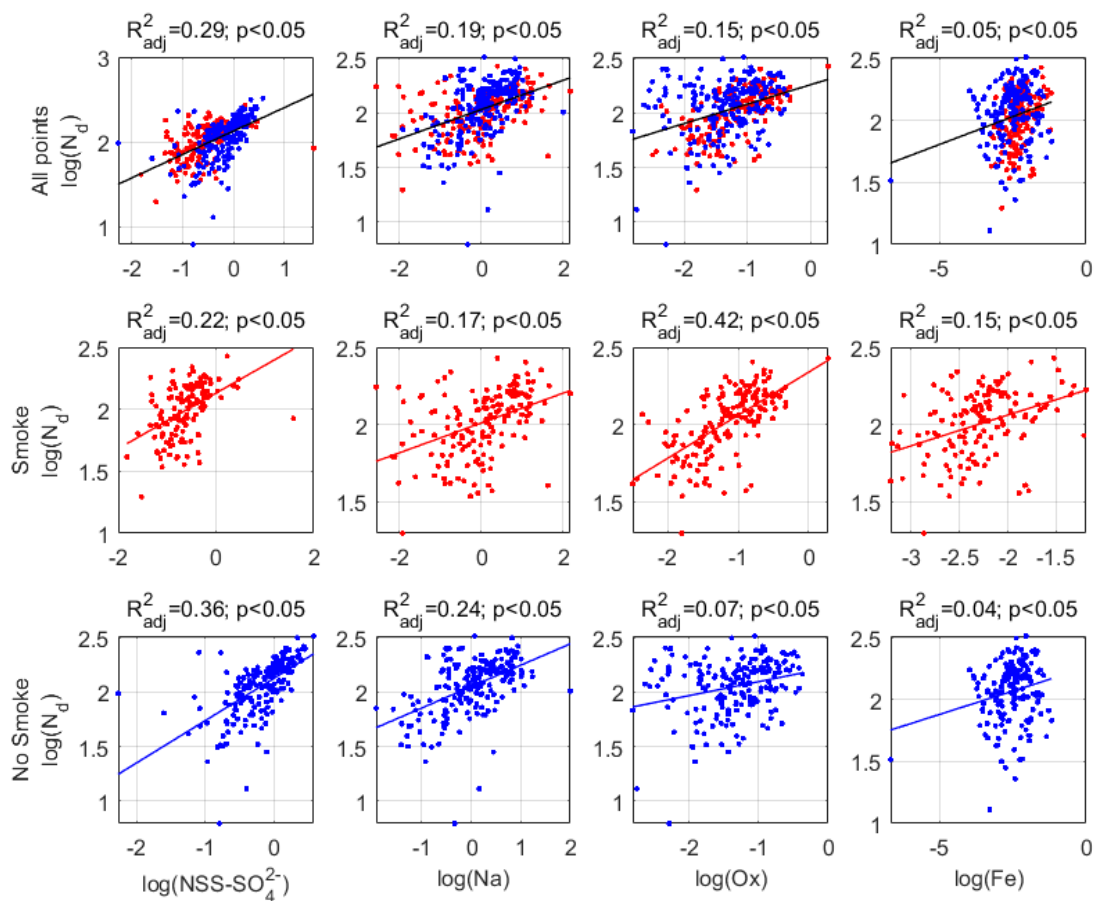
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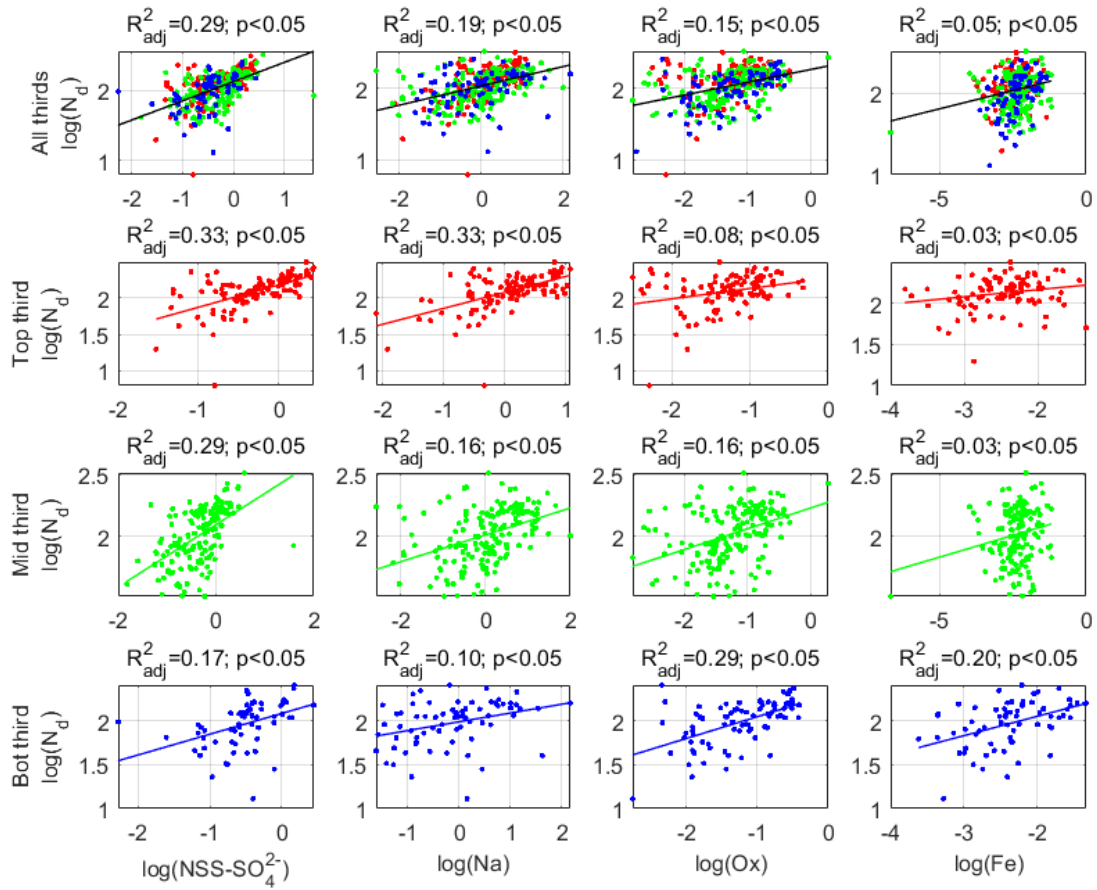
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 18 **Figure S1.** Time series of altitude (top), vertical wind speed ( $w$ ) (middle), and the standard  
 19 deviation of vertical wind speed ( $\sigma_w$ ) (below) for a representative flight on 9 July 2011. The red  
 20 trace in the top panel indicates when the aircraft was inside the cloud (i.e.,  $LWC \geq 0.02 \text{ g m}^{-3}$ ).  
 21 The bold blue lines in the middle and bottom panels are the averages of  $w$  and  $\sigma_w$ , over the  
 22 duration of the shaded blue boxes, respectively. The dashed lines in the bottom panel represent  
 23 the 33<sup>rd</sup> percentile and 66<sup>th</sup> percentile of the data in this study.



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 25 **Figure S2.** Scatterplots of four selected species when binning by  $\sigma_w$ . These four species were  
 26 selected owing to their ability to represent distinct aerosol sources in the study region. Red: top  
 27 33<sup>rd</sup> percentile ( $\sigma_w \geq 0.33 \text{ m s}^{-1}$ ); Blue: bottom 33<sup>rd</sup> percentile ( $\sigma_w \leq 0.27 \text{ m s}^{-1}$ ); Black: between  
 28 bottom and top percentiles ( $0.27 \text{ m s}^{-1} \leq \sigma_w \leq 0.33 \text{ m s}^{-1}$ ).



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 30 **Figure S3.** Scatterplots of four selected species when binning by smoke influence. Red: smoke  
 31 influence; Blue: no smoke influence.  
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41 **Figure S4.** Scatterplots of four selected species when binning by normalized in-cloud height.

42 Red: top third; Green: mid third; Blue: bottom third.