



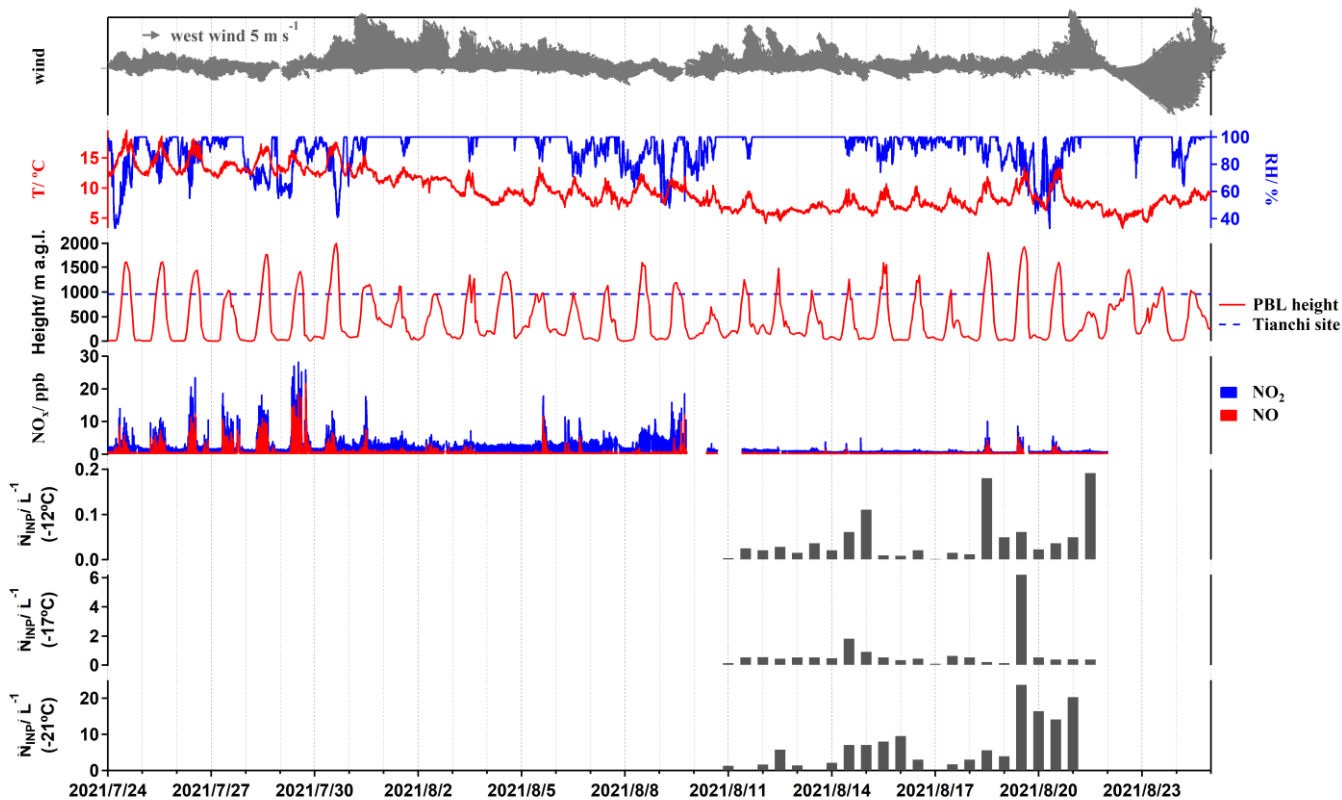
Supplement of

Measurement report: Atmospheric ice nuclei in the Changbai Mountains (2623 m a.s.l.) in northeastern Asia

Yue Sun et al.

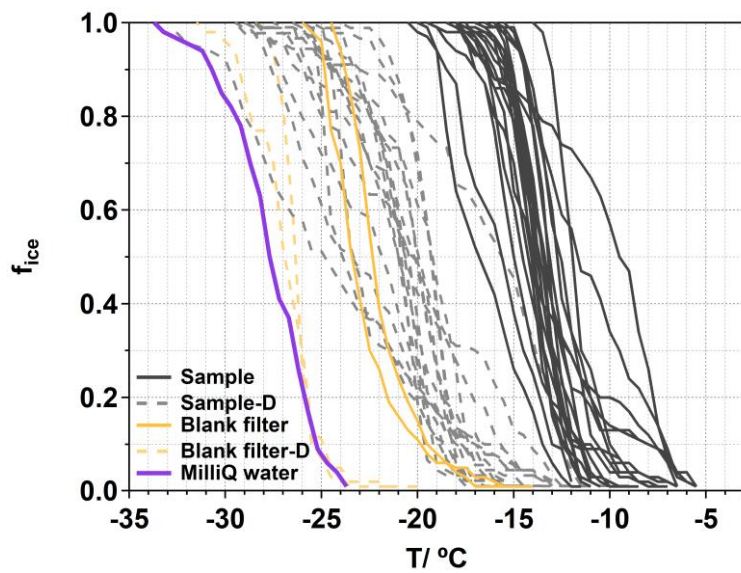
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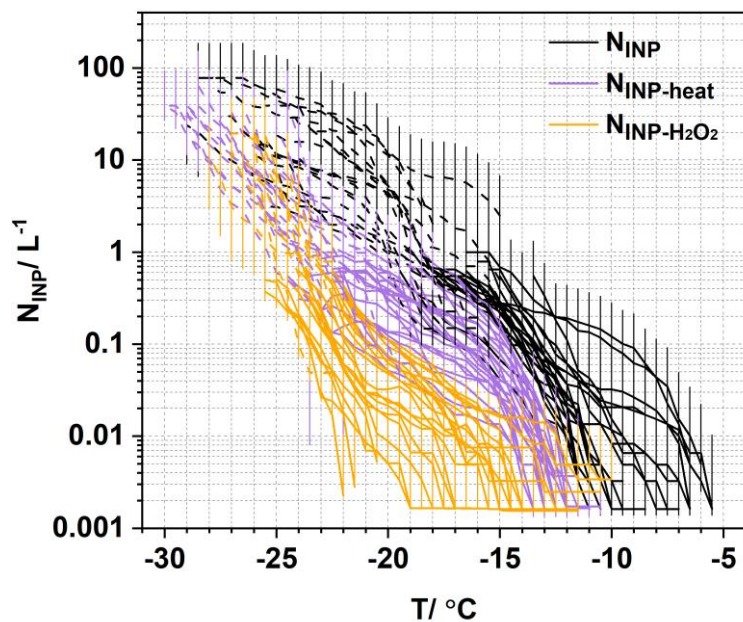
Figure S1. Time series of meteorological parameter (i.e., wind, temperature, and RH), PBL height, the height of Tianchi site, NO_x , and the cumulative number concentration of INPs (N_{INP}) at $-12\text{ }^\circ\text{C}$, $-17\text{ }^\circ\text{C}$ and $-21\text{ }^\circ\text{C}$ measured during the campaign.



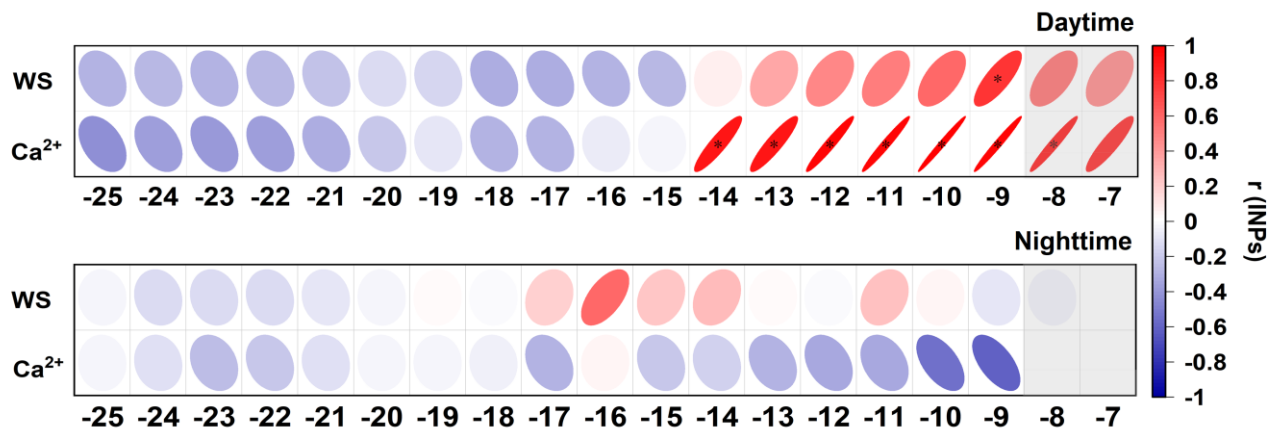
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Figure S2. Frozen fractions (f_{ice}) of collected samples measured by GIGINA as functions of temperature is shown by the black curves, and presented together with blank filters (orange curves) and MilliQ water (purple curves) as background signals. The dashed line presented the diluted sample suspension.

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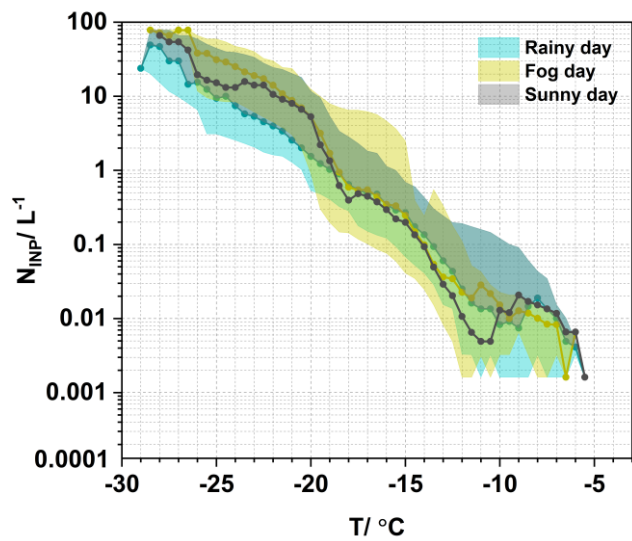


30 **Figure S3.** The N_{INP} , $N_{\text{INP-heat}}$, and $N_{\text{INP-H}_2\text{O}_2}$ as function of temperature. The solid line and dotted line show the sample measurement result by immersed in 5 mL MilliQ water and diluted the sample 30-120 times, respectively. The original N_{INP} is marked by black dots, $N_{\text{INP-heat}}$ is marked by purple dots, and $N_{\text{INP-H}_2\text{O}_2}$ is marked by pink dots, with 20% error bars indicating the 95% confidence intervals.



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Figure S4. Correlation analysis between N_{INP} with wind speed (WS) and Ca^{2+} as functions of temperature. The r denotes the Pearson correlation coefficients. The asterisk indicates $p < 0.05$, while the shades indicate that the number of data points is less than half of samples at each temperature.



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Figure S5. N_{INP} for sunny, foggy, and rainy day as functions of temperature. Each point represents the median value and the shadow area represents the maximum and minimum value.

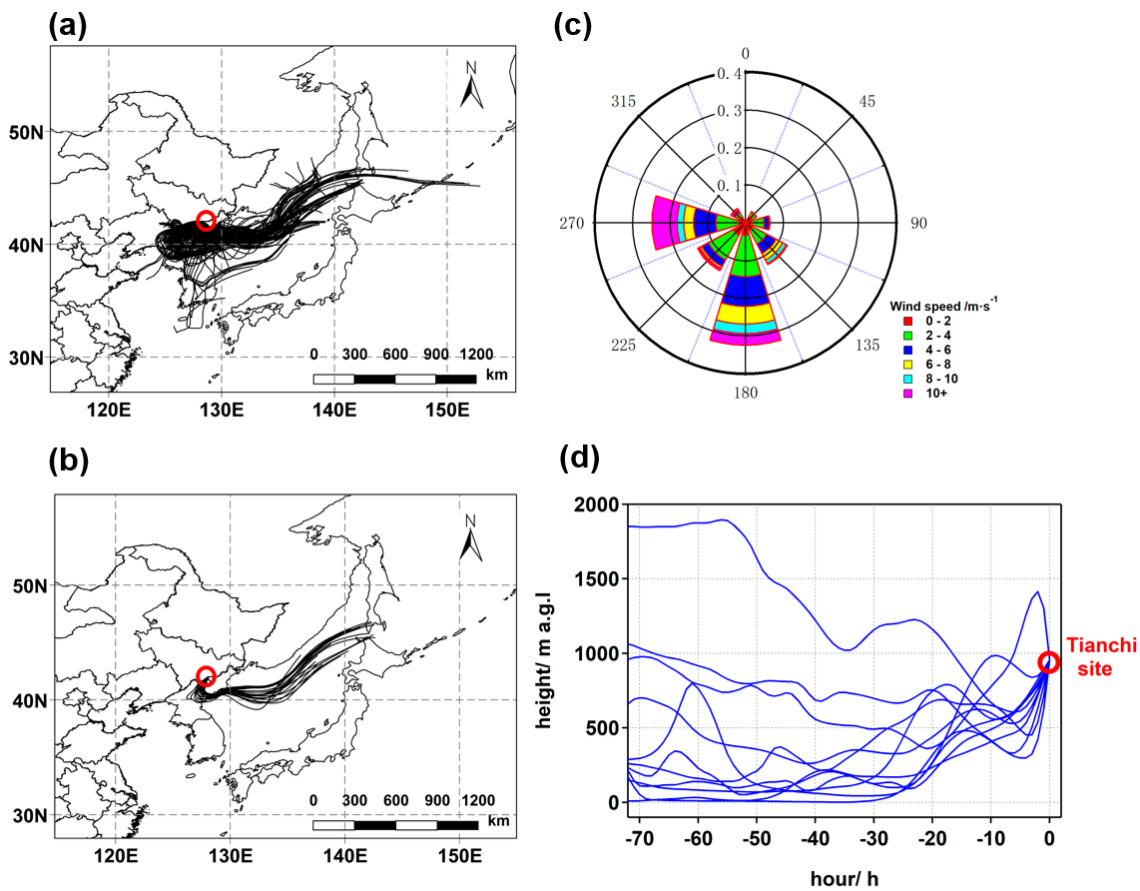
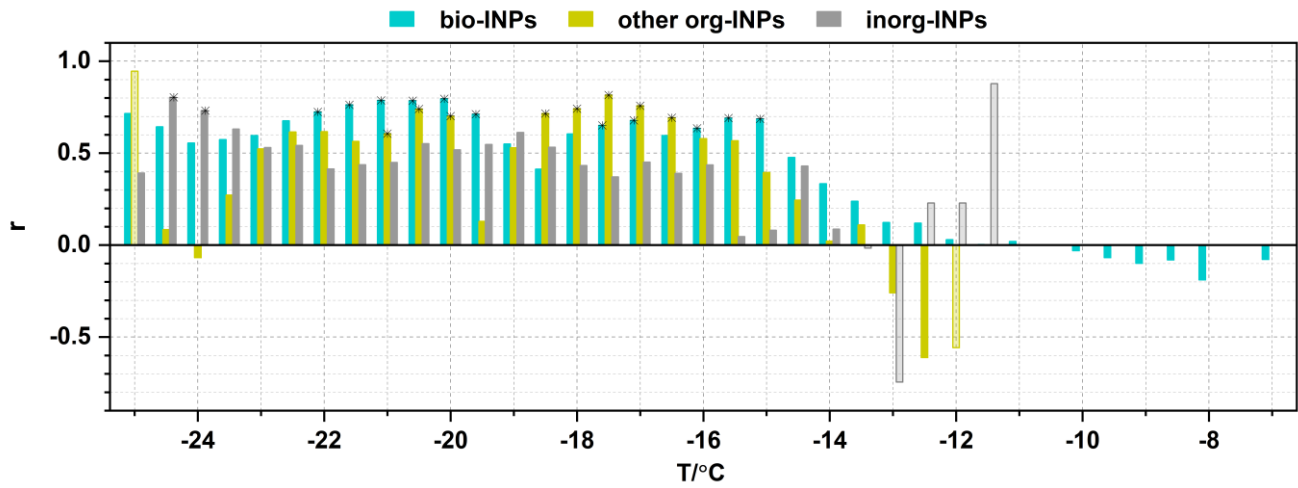


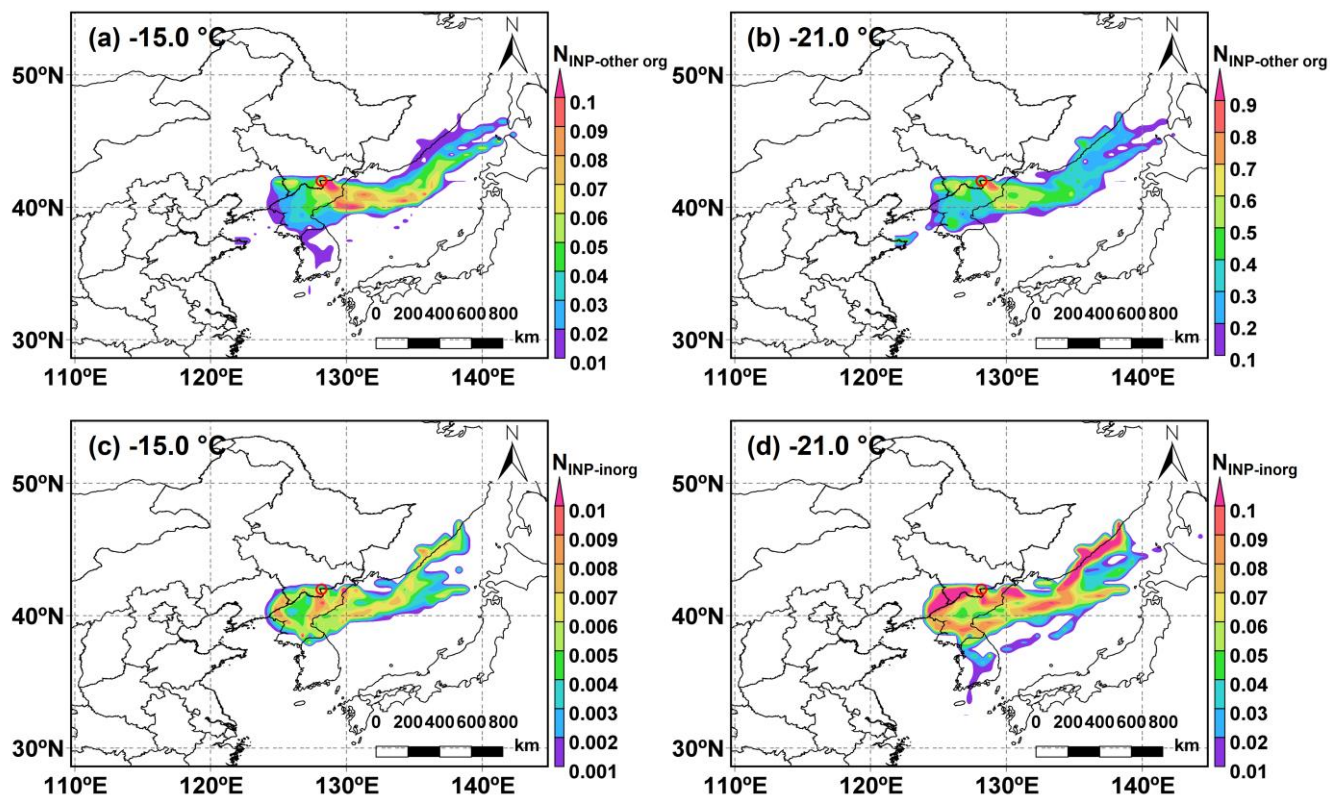
Figure S6. Air mass trajectories over the entire campaign duration (a) and Aug. 13, 2021 (b). Wind rose illustrating wind speed and directions measured in one-minute time resolution at the sampling site (c). and the average daytime air mass trajectory heights (d).

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55 **Figure S7.** The relationship between PBL height and $N_{INP-bio}$, $N_{INP-other\ org}$ as well as $N_{INP-inorg}$ during daytime (8:00-17:00 LT, m above ground level) as a function of temperature. The r denotes the Pearson correlation coefficients. The asterisk indicates $p < 0.05$. The shades indicate that the data points number were less than half of all samples at each temperature.



60 Figure S8. The concentration-weighted trajectory (CWT) analysis for the distribution of $N_{\text{INP-other org}}$ (a, b) and $N_{\text{INP-inorg}}$ (c, d) at -15 and -21 °C during the measurement. The red circle represents the Tianchi site.

Table S1. The information of filter samples, including sample number, start time, end time, duration, and total sampling volume.

Sample number	Start time	End time	Total Volume/ L
2021.8.10-Night	2021/8/10 18:00	2021/8/11 5:30	34017
2021.8.11-Day	2021/8/11 10:30	2021/8/11 17:30	21420
2021.8.11-Night	2021/8/11 18:00	2021/8/11 20:26	28017
	2021/8/11 20:32	2021/8/12 3:32	
2021.8.12-Day	2021/8/12 6:00	2021/8/12 17:30	34845
2021.8.12-Night	2021/8/12 18:00	2021/8/13 5:30	34707
2021.8.13-Day	2021/8/13 6:00	2021/8/13 17:30	34362
2021.8.13-Night	2021/8/13 18:00	2021/8/14 5:30	34638
2021.8.14-Day	2021/8/14 6:00	2021/8/14 17:30	34569
2021.8.14-Night	2021/8/14 18:00	2021/8/15 5:30	34293
2021.8.15-Day	2021/8/15 6:00	2021/8/15 18:00	36144
2021.8.15-Night	2021/8/15 18:30	2021/8/16 5:30	32934
2021.8.16-Day	2021/8/16 6:00	2021/8/16 17:30	34638
2021.8.16-Night	2021/8/16 18:00	2021/8/17 5:30	34362
2021.8.17-Day	2021/8/17 6:00	2021/8/17 17:30	34224
2021.8.17-Night	2021/8/17 18:00	2021/8/18 5:30	34431
2021.8.18-Day	2021/8/18 10:00	2021/8/18 17:30	22725
2021.8.18-Night	2021/8/18 18:00	2021/8/19 5:30	34569
2021.8.19-Day	2021/8/19 6:00	2021/8/19 17:30	34431
2021.8.19-Night	2021/8/19 18:00	2021/8/20 5:30	34293
2021.8.20-Day	2021/8/20 6:00	2021/8/20 17:30	34707
2021.8.20-Night	2021/8/20 18:00	2021/8/21 5:30	34776
2021.8.21-Day	2021/8/21 6:00	2021/8/21 17:30	34431
Blank-Night	2021/8/23 17:29	2021/8/24 5:36	-
Blank-Day	2021/8/24 7:30	2021/8/24 18:50	-

65 Note: On August 11, a brief power outage caused the instrument to stop measuring with about 6 min.

Table S2. The Pearson correlation coefficients between (a) N_{INP} , (b) $N_{INP-bio}$, (c) $N_{INP-other\ org}$, (d) $N_{INP-inorg}$ and meteorological parameters, chemical compositions, as functions of temperature. Coefficients reported in bold are statistically significant at $p < 0.05$, while the shades indicate that the number of data points is less than half (the sample number is less than 11) of all samples at each temperature. When r is below 0.5, the correlation is considered weak; when r exceeds 0.5, the correlation is considered good.

	-25	-24	-23	-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7
(a)																			
T	0.63	0.61	0.63	0.64	0.60	0.51	0.43	0.47	0.49	0.52	0.58	0.43	0.16	0.28	0.25	0.19	0.12	0.08	-0.14
RH	- 0.66	- 0.63	- 0.69	- 0.69	- 0.65	-0.6	0.44	0.37	0.28	0.26	0.31	0.04	0.07	0.03	0.08	0.16	0.09	0.17	0.14
WS	-0.22	-0.28	-0.24	-0.25	-0.2	0.12	0.08	-0.2	0.23	0.22	0.23	0.04	0.20	0.36	0.52	0.57	0.74	0.57	0.44
BC	0.84	0.8	0.83	0.76	0.63	0.53	0.34	0.23	0.16	0.1	0.13	0.11	0.07	0.06	0.14	0.32	0.28	0.54	0.37
PM _{2.5}	0.63	0.56	0.54	0.47	0.43	0.42	0.27	0.11	0.02	0.04	0.01	0.04	0.19	0.17	0.07	0	0.17	-0.1	0.04
NH ₄ ⁺ +NO ₃ ⁻ +SO ₄ ²⁻	0.13	0.01	0.09	0.05	0.02	0.05	0.01	0.14	0.18	0.22	0.26	0.43	0.20	0.29	0.18	0.24	0.19	0.57	0.64
Ca ²⁺	-0.22	-0.27	-0.31	-0.30	-0.24	-0.14	-0.09	-0.13	-0.19	-0.09	-0.14	0.05	-0.05	0.08	0.64	0.67	0.94	0.93	0.71
(b)																			
T	0.53	0.59	0.62	0.64	0.59	0.48	0.37	0.48	0.54	0.5	0.57	0.44	0.16	0.27	0.25	0.19	0.12	0.08	-0.14
RH	- 0.58	- 0.68	- 0.68	- 0.69	- 0.64	0.57	0.37	0.34	0.28	0.27	0.31	0.05	0.06	0.04	0.08	0.16	0.09	0.17	0.14
WS	-0.17	-0.23	-0.24	-0.24	-0.19	-0.1	-0.1	0.28	0.25	0.21	-0.2	0.11	0.2	0.37	0.52	0.57	0.74	0.57	0.44
Isoprene	0.66	0.45	0.37	0.45	0.5	0.42	0.44	0.14	0.13	0.01	0.43	0.44	0.49	0.53	0.63	0.61	0.7	0.66	0.94
Isoprene × O ₃	0.95	0.71	0.7	0.71	0.69	0.51	0.47	0.09	0.16	0.44	0.13	0.03	0.09	0.33	0.65	-	-	-	-
Cl ⁻	0.24	0.32	0.38	0.35	0.31	0.31	0.22	0.15	0.12	0.03	0.05	0.01	0.15	0.19	0.22	0.31	0.32	0.51	0.43
Ca ²⁺	-0.23	-0.25	-0.32	-0.31	-0.24	-0.15	-0.12	-0.15	-0.18	-0.11	-0.13	0.09	-0.04	0.08	0.64	0.67	0.94	0.93	0.71
(c)																			
T	0.96	0.15	0.51	0.29	0.28	0.62	0.61	0.7	0.68	0.51	0.32	0.1	0.16	-0.3	-	-	-	-	-
RH	-	0.02	-0.17	-0.18	-0.23	-0.42	0.67	0.44	0.33	0.18	0.04	0.01	0.01	0.22	-	-	-	-	-

WS	-0.4	-	-	-	-	-	-	-	-	-	-	-	-0.3	-	-	-	-	-
Isoprene	-	0.68	0.33	0.24	0.24	0.28	-	0.69	0.7	0.76	0.76	0.73	-	-	-	-	-	
Isoprene ×O ₃	-	0.32	-0.6	-	-	-	0.09	0.54	0.58	0.61	0.59	0.64	-	-	-	-	-	
OC	0.85	0.35	0.12	0.32	0.42	0.07	0.2	-	-	-	-	-	0.28	0.43	-	-	-	
EC	0.93	0.36	0.07	0.13	0.25	0	0.18	0.22	0.16	0.27	0.28	0.35	0.31	0.43	-	-	-	
(d)																		
T	0.06	0.26	0.59	0.34	0.34	0.36	0.47	0.32	0.34	0.1	0.04	-	-	-	-	-	-	
RH	-	-	-0.7	-	-	-	-	-	-	-0.5	-	-	-	-	-	-	-	
WS	0.28	-	-	-	-	-0.1	-	-	-	0.24	0.08	0.01	0.47	0.49	0.91	-	-	
NH ₄ ⁺ +NO ₃ ⁻ +SO ₄ ²⁻	0.78	0.65	0.46	0.63	0.62	0.49	0.43	0.34	0.36	0.49	0.23	0.41	0.64	0.56	-	-	-	
Cl ⁻	-	-	-	-	-0.3	-	-	-	-	-	-0.3	-	-	-	-	-	-	
Ca ²⁺	0.34	-	-	-	-	-	-	-	-	0.27	0.39	0.21	-	0.03	-	-	-	
BC	0.28	0.46	0.85	0.74	0.74	0.78	0.8	0.83	0.74	0.48	0.24	-0.2	-	-	0.82	-	-	