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Air mass physiochemical characteristics over New Delhi: impacts on aerosol hygroscopicity and cloud condensation nuclei (CCN) formation

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Text S1

The following checks were carried out for all clusters:(a) If $R_{HOA} < R_{Ref\_HOA}$, then aerosols are HOA, else if $R_{BBOA} < R_{Ref\_BBOA}$, then aerosols are BBOA else if $R_{OOA} < R_{Ref\_OOA}$, then aerosols are OOA else mixed, (b) If $R_{BBOA} < R_{Ref\_BBOA}$, then aerosols are BBOA, else if $R_{HOA} < R_{Ref\_HOA}$, then aerosols are HOA else if $R_{0OA} < R_{Ref\_OOA}$, then aerosols are OOA else mixed, (c) If $R_{OOA} < R_{Ref\_OOA}$, then aerosols are OOA, else if $R_{BBOA} < R_{Ref\_BBOA}$, then aerosols are BBOA else if $R_{HOA} < R_{Ref\_HOA}$, then aerosols are HOA else mixed, (d) If $R_{OOA} < R_{Ref\_OOA}$, then aerosols are OOA, else if $R_{HOA} < R_{Ref\_HOA}$, then aerosols are HOA else if $R_{BBOA} < R_{Ref\_BBOA}$, then aerosols are BBOA else mixed, (e) If $R_{HOA} < R_{Ref\_HOA}$, then aerosols are HOA, else if $R_{OOA} < R_{Ref\_OOA}$, then aerosols are OOA else if $R_{BBOA} < R_{Ref\_BBOA}$, then aerosols are BBOA else mixed and (f) If $R_{BBOA} < R_{Ref\_BBOA}$, then aerosols are BBOA, else if $R_{OOA} < R_{Ref\_OOA}$, then aerosols are OOA else if $R_{HOA} < R_{Ref\_HOA}$, then aerosols are HOA else mixed. If all 6 conditions were evaluated as the same specific category (i.e. HOA or BBOA or OOA), then that category was considered as the aerosol type for a cluster else they were considered as mixed.

Figure S1: HYSPLIT 5-day back trajectory cluster analysis for all seasons

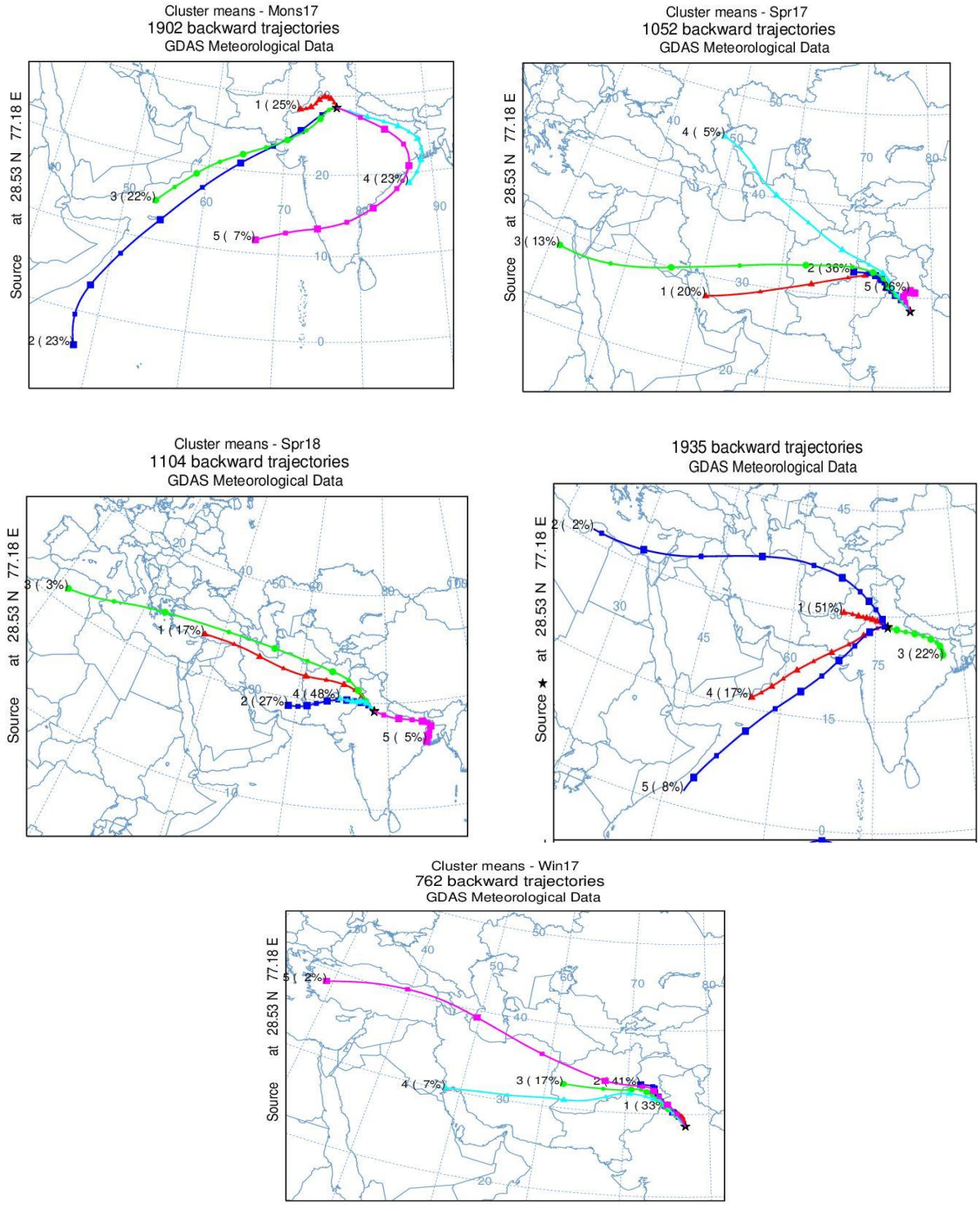

Figure S2: Diurnal variations of volume fractions of $(NH_4)_2SO_4$, NH_4NO_3, NH_4Cl (representing the dominant contributors to hygroscopicity of air masses) and organics.

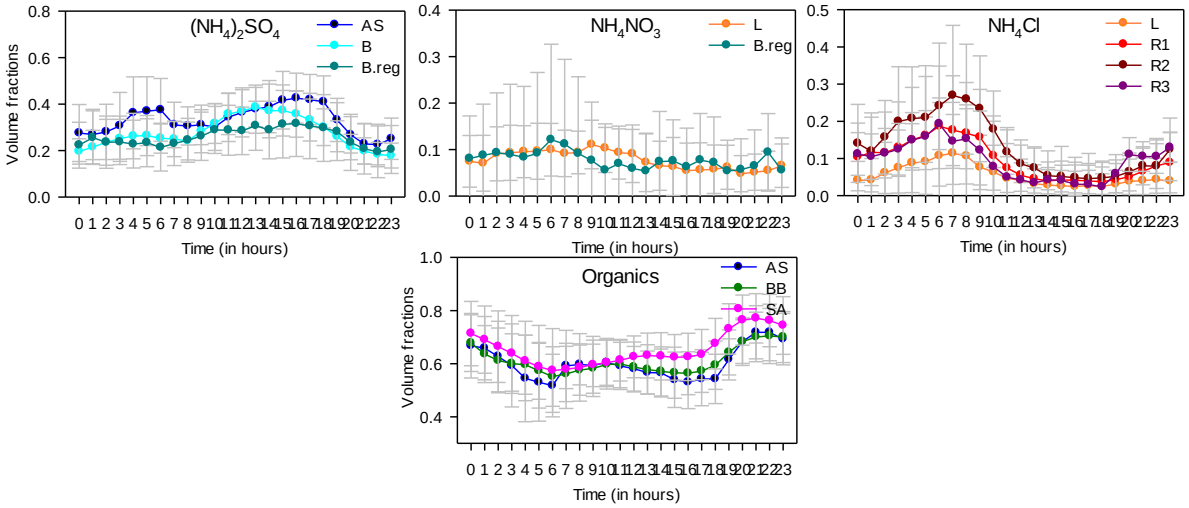

Figure S3: Variation of CCN number concentration and activated fraction with SS for BB branches (B and B.reg) and SA branches (L, R1, R2, and R3).

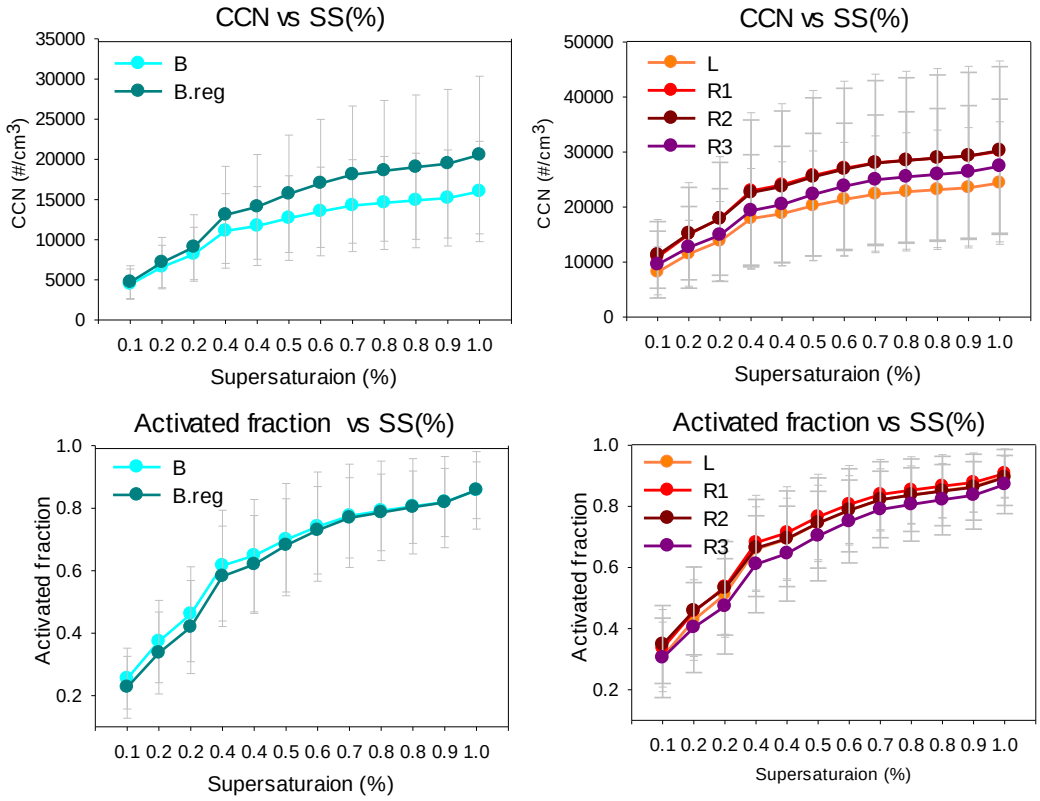

Figure S4: Diurnal variation of (a) N_{CCN} at 0.1%, 0.4% and 0.8% SS, (b) activated fraction at 0.1%, 0.4 %and 0.8% SS, (c) N_{CN}, N_{Aitken}, $N_{Accumulation}$, (d) D_c at 0.1%, 0.4% and 0.8% SS, (e) Chemical Dispersion, and (f) GMD for BB (B and B.reg) air masses.

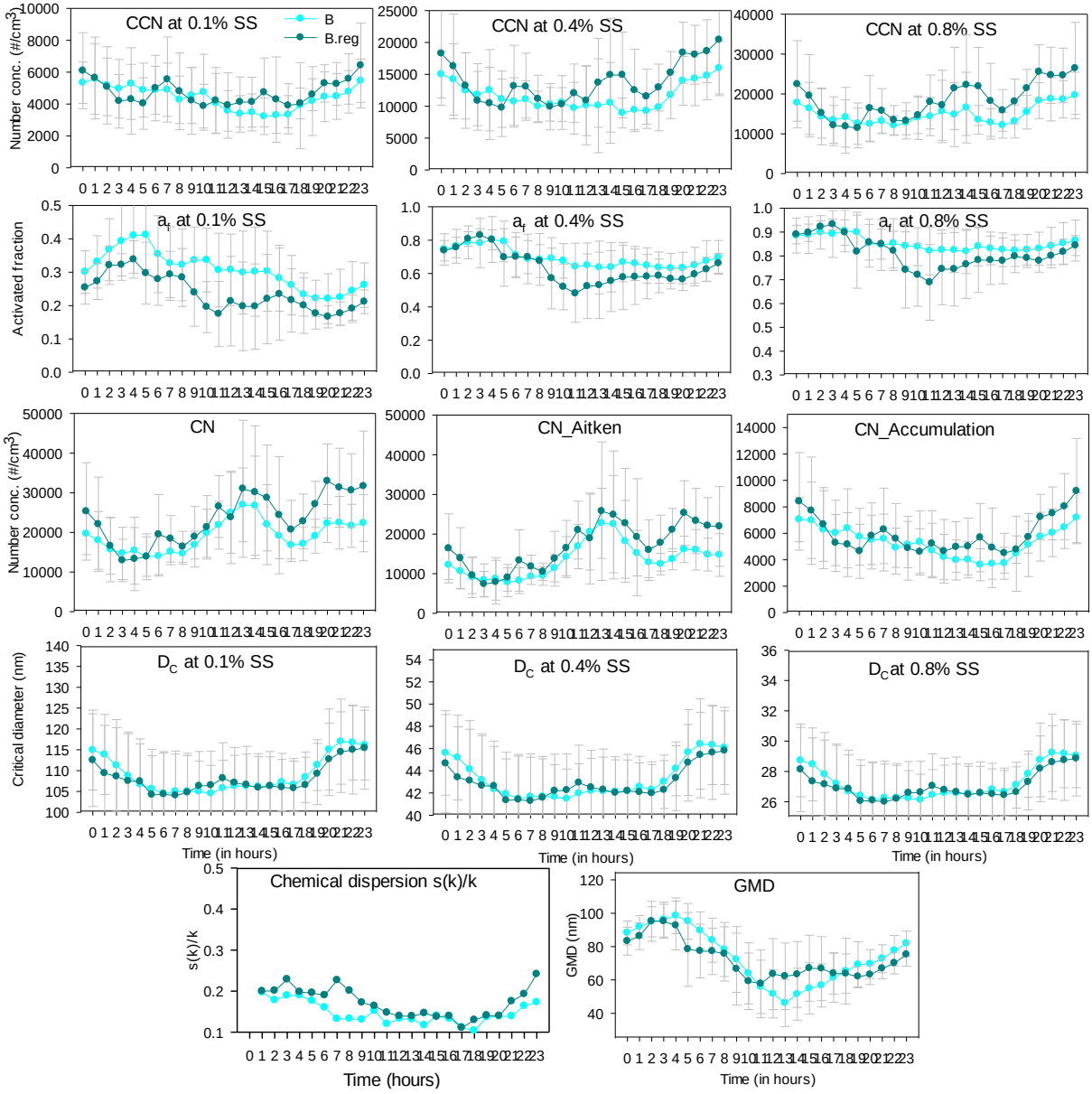

Figure S5: Diurnal variation of (a) N_{CCN} at 0.1%, 0.4% and 0.8% SS, (b) activated fraction at 0.1%, 0.4 %and 0.8% SS, (c) N_{CN}, N_{Aitken}, $N_{Accumulation}$, (d) D_c at 0.1%, 0.4% and 0.8% SS, (e) Chemical dispersion, and (f) GMD for SA (L, R1, R2 and R3) air masses.

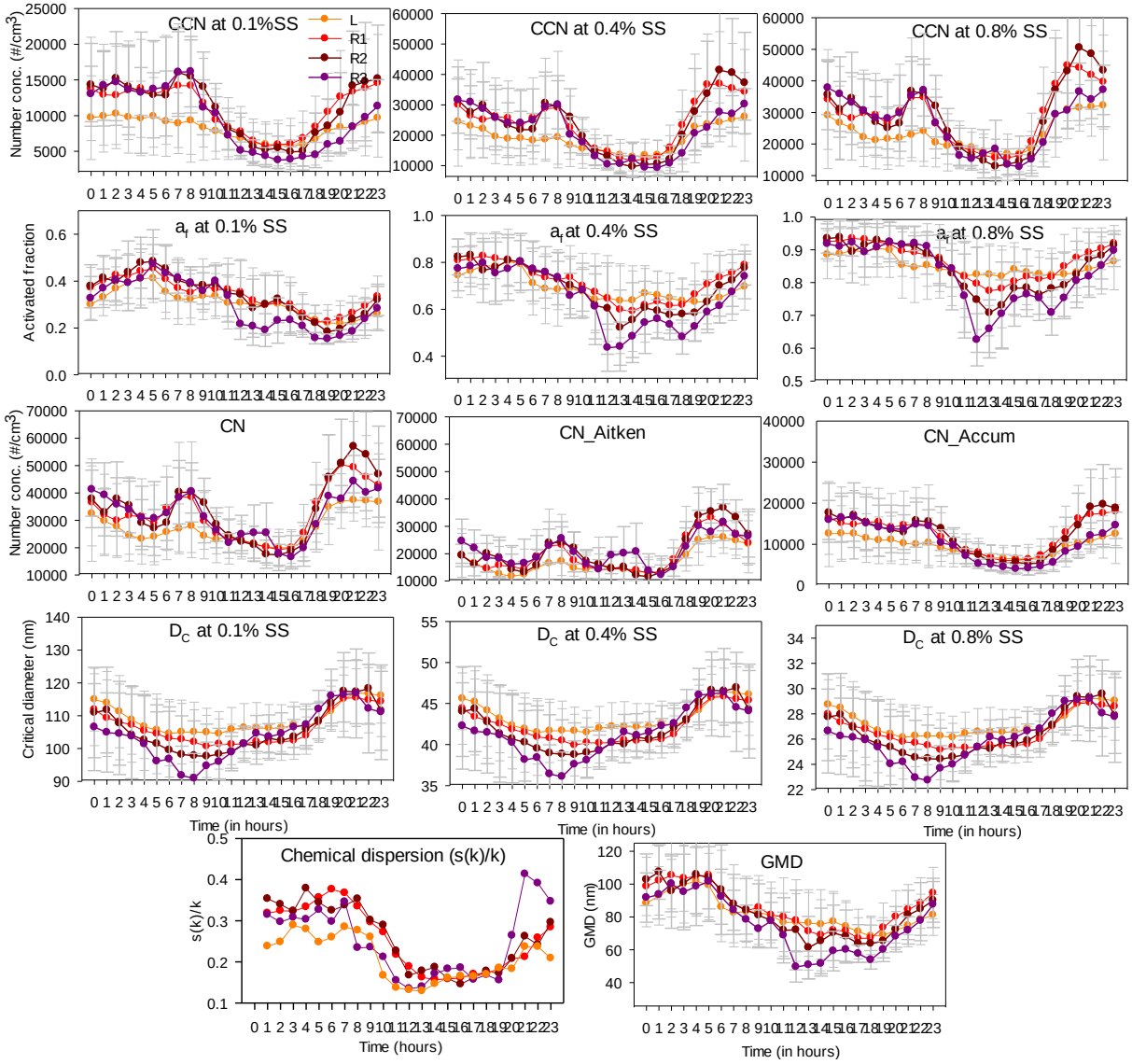

Figure S6: Scatter plots between ns-NH_4^+ vs. NO_3^- for B (left) and B.reg (right) branches.

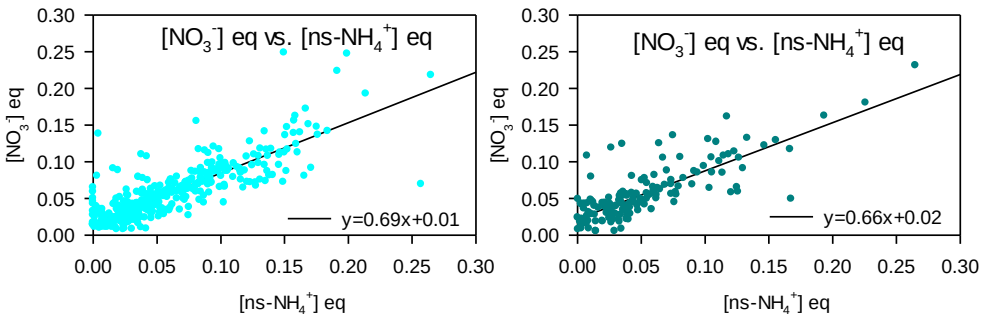

Table S1: ANR and r^2 values between (a) [NH_4^+] and [O_4^{2-}], (b) [ns-NH_4^+] and [Cl^-], (c) [ns-NH_4^+] and [NO_3^-], and (d) [ns-NH_4^+] and [Cl^-+ NO_3^-] for all air masses.

Cluster	ANR	$r^2_{NH4+/SO4}$	$r^2_{ns-NH4+/Cl-}$	$r^2_{ns-NH4+/NO3-}$	$r^2_{ns-NH4+/[Cl-+NO3-]}$
A	0.95	0.78	0.71	0.45	0.84
BB	0.91	0.75	0.43	0.69	0.59
SA	0.85	0.34	0.90	0.54	0.95
B	0.96	0.78	0.56	0.70	0.83
B.reg	0.83	0.73	0.27	0.63	0.31
L	0.92	0.56	0.87	0.62	0.94
R1	0.84	0.53	0.88	0.59	0.94
R2	0.81	0.39	0.93	0.54	0.96
R3	0.79	0.36	0.95	0.60	0.97

Table S2: Mean total CN concentrations (cm^{-3}), CN in Aitken and Accumulation modes of all clusters.

Cluster	CN		Aitken CN		Accumulation CN	
	Mean	Std	Mean	Std	Mean	Std
A	20558	9654	15860	8083	4446	3203
BB	20864	9731	14964	8758	5595	2536
SA	31406	15168	19266	9615	11602	7392
B	19025	7704	13344	6969	5392	2323
B.reg	24333	11956	18020	10745	5979	2856
L	27009	11651	16979	7933	9584	5382
R1	32772	16475	19792	10252	12395	8097
R2	33371	14989	20243	9612	12552	7290
R3	30974	12223	20245	8375	10289	5949

Table S3: Summary of r^2 values between GMD and a_f for all clusters at SS=0.1%, 0.4% and 0.8%.

Cluster	$r^2_{af\_0.1/GMD}$	$r^2_{af\_0.4/GMD}$	$r^2_{af\_0.8/GMD}$
A	0.873721	0.954904	0.787067
BB	0.867738	0.985957	0.924469
SA	0.665737	0.955936	0.850547
B	0.887764	0.9867	0.933447
B.reg	0.793281	0.97207	0.891727
L	0.77255	0.952054	0.881572
R1	0.661235	0.941952	0.836889
R2	0.609523	0.952322	0.870326
R3	0.684657	0.954688	0.886271

Table S4: Contribution of BCwb and BCff for the various air masses

Cluster	BCwb	BCff
A	21%	79%
BB	21.60%	78.40%
SA	24.70%	75.30%
B	26.80%	73.20%
B.reg	21.60%	78.40%
L	13.90%	86.10%
R1	25.20%	74.80%
R2	29%	71%
R3	29.20%	70.80%