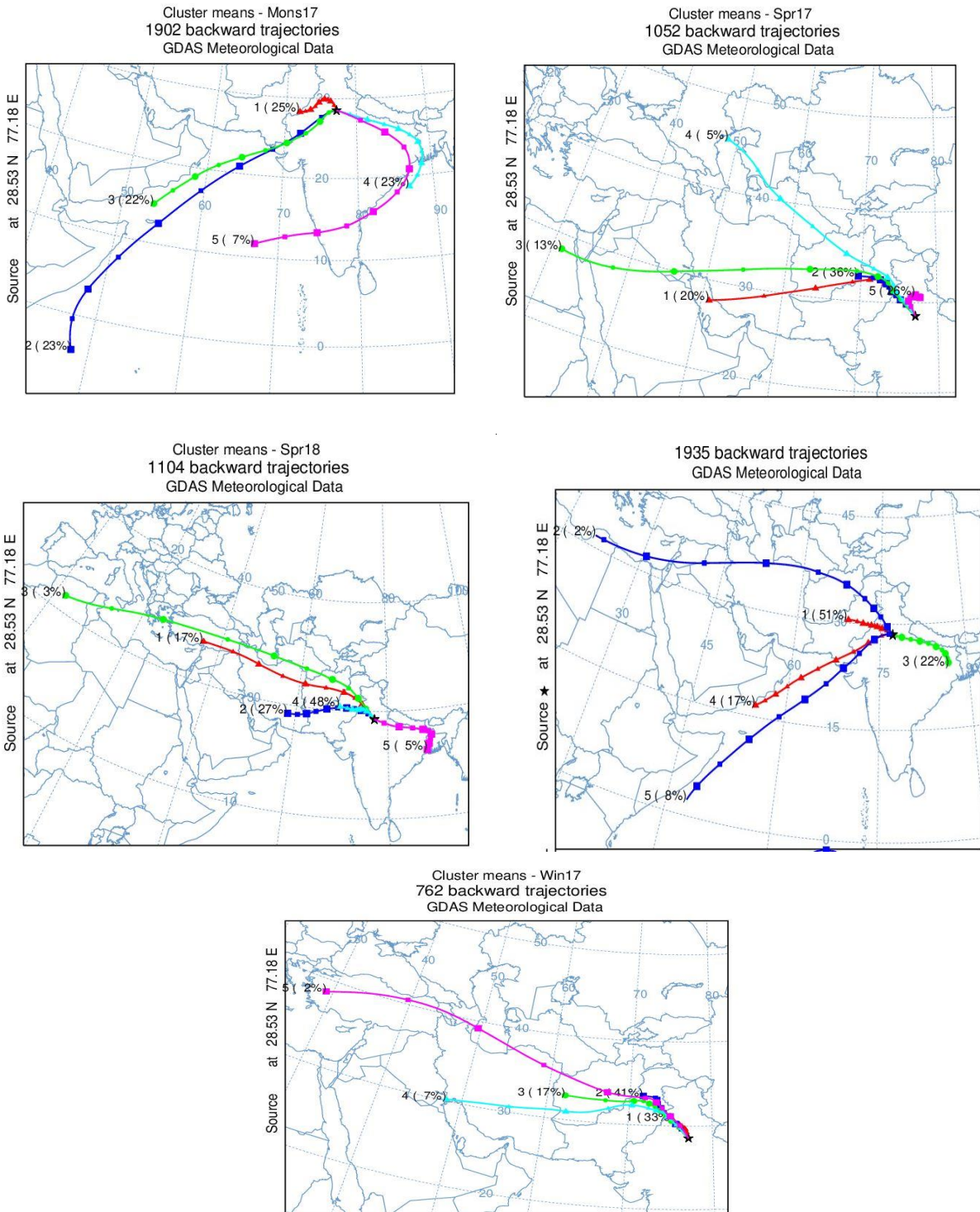
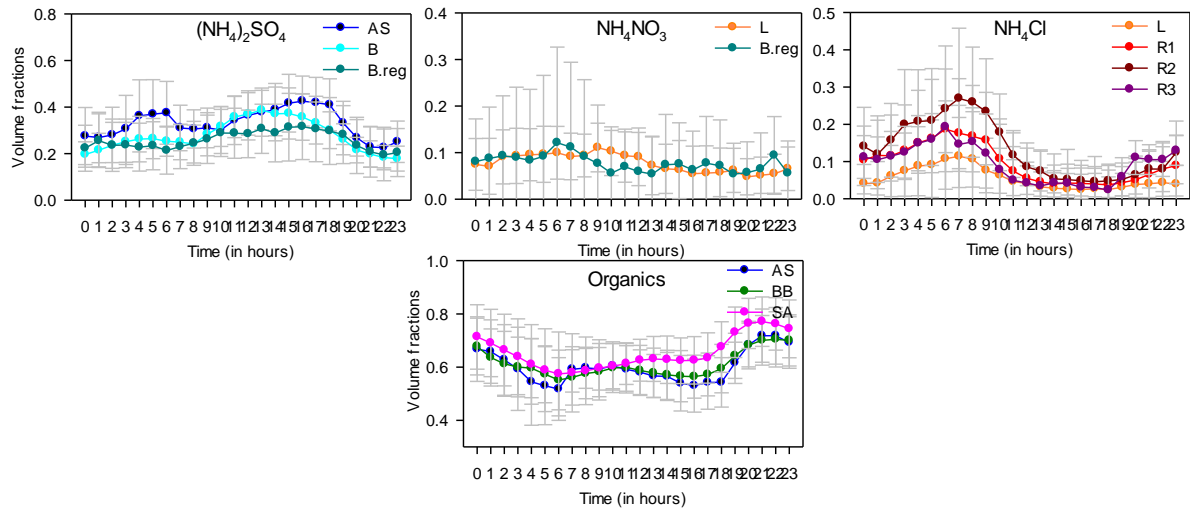


## Supplementary Information

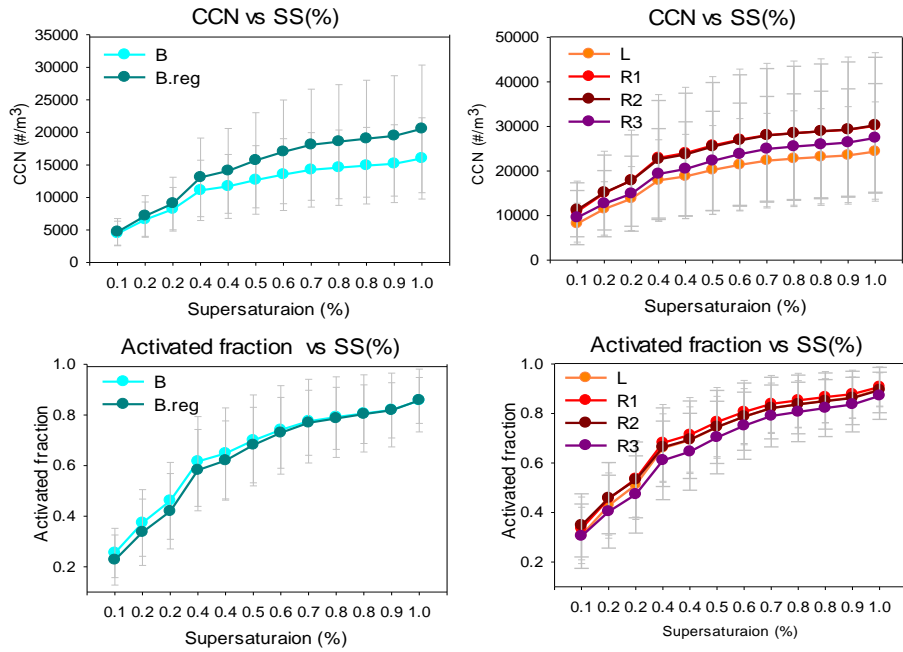
Figure S1: HYSPLIT 5-day back trajectory cluster analysis for all seasons



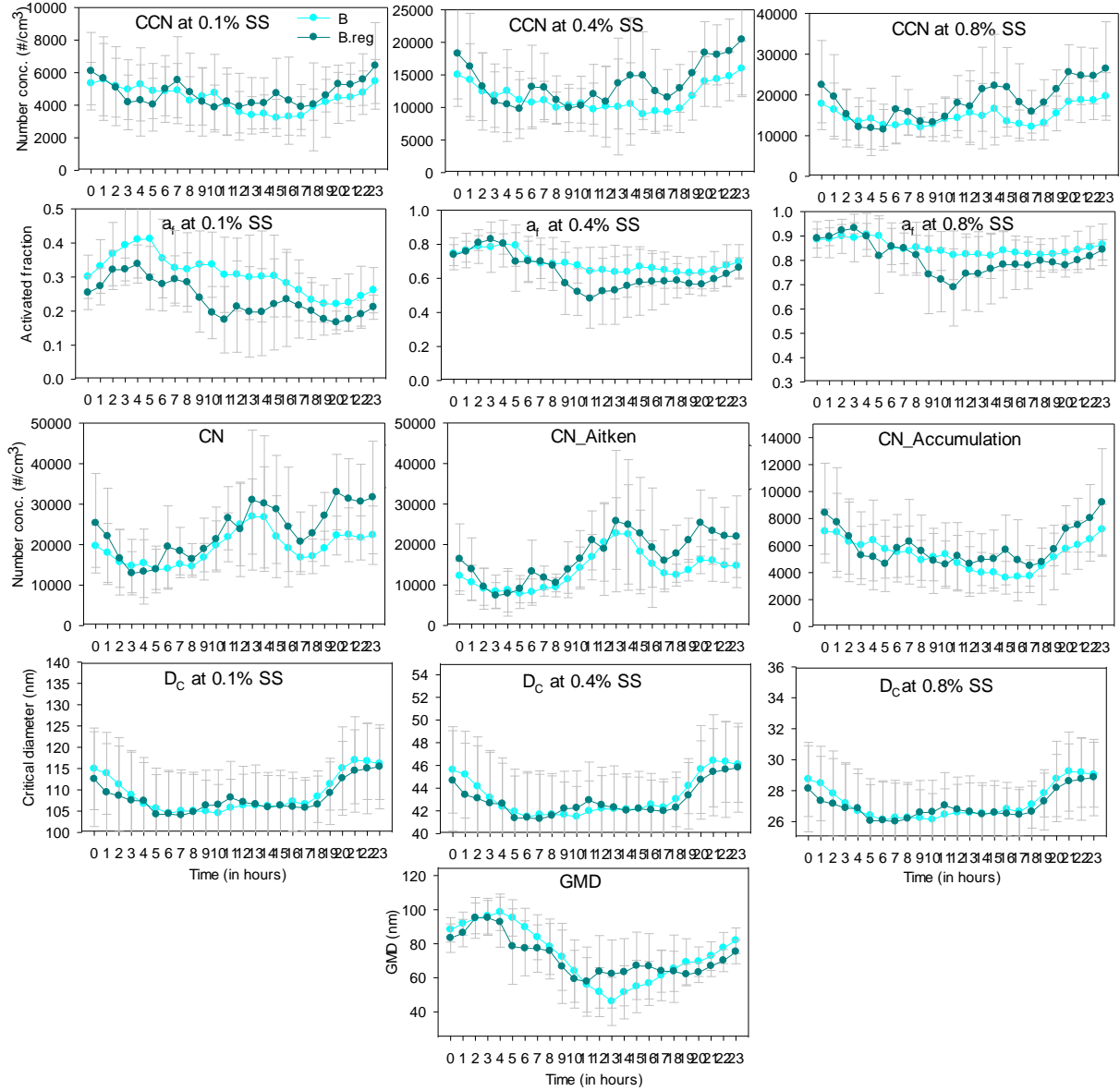
**Figure S2:** Diurnal variations of volume fractions of  $(\text{NH}_4)_2\text{SO}_4$ ,  $\text{NH}_4\text{NO}_3$ ,  $\text{NH}_4\text{Cl}$  (representing the dominant contributors to hygroscopicity of air masses) and organics.



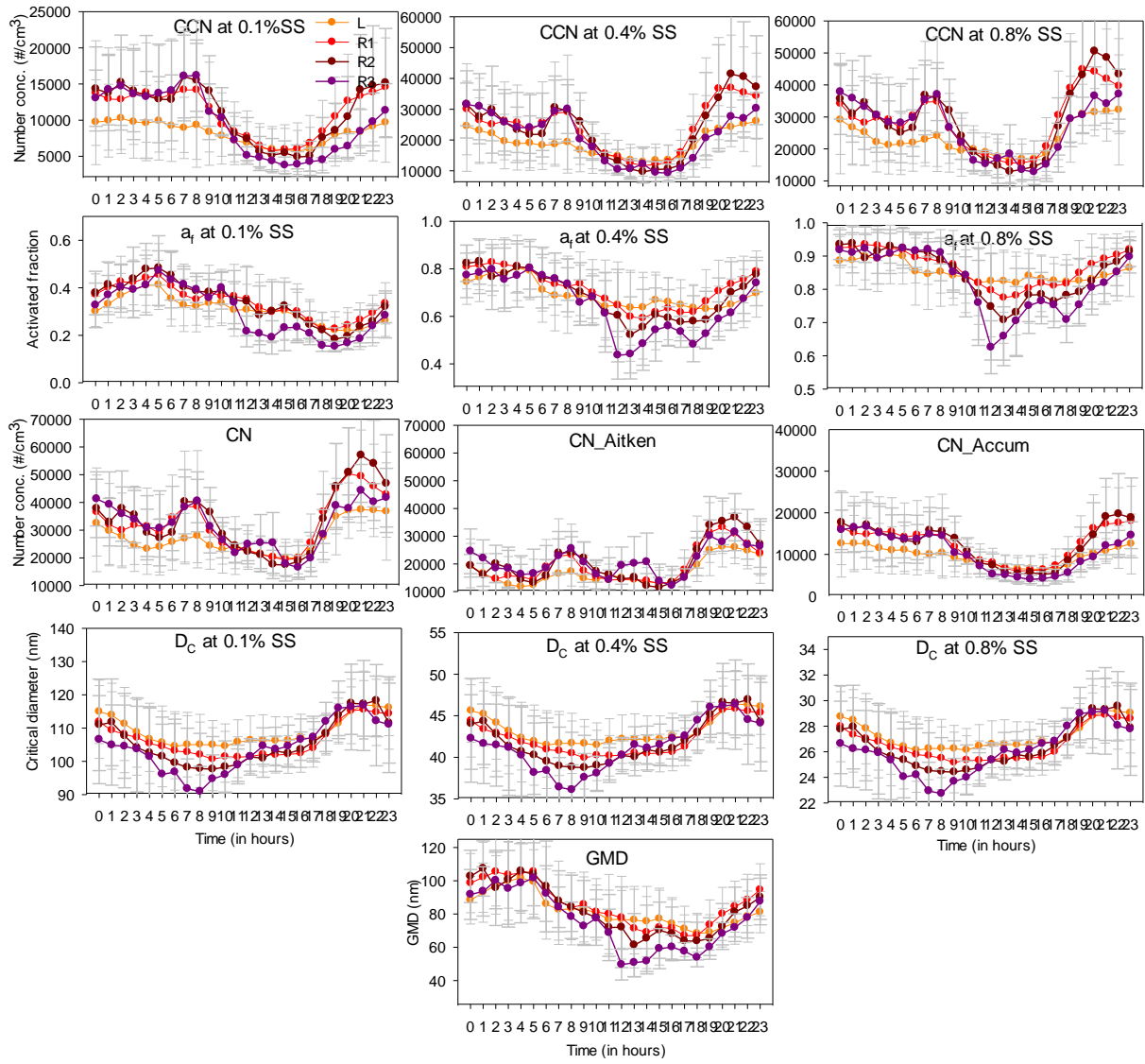
**Figure S3:** Variation of CCN number concentration and activated fraction with SS for BB branches (B and B.reg) and SA branches (L, R1, R2, and R3).



**Figure S4:** Diurnal variation of  $N_{CCN}$  at 0.1%, 0.4% and 0.8% SS, activated fraction at 0.1%, 0.4 % and 0.8% SS,  $N_{CN}$ ,  $N_{Aitken}$ ,  $N_{Accumulation}$  and  $D_c$  at 0.1%, 0.4% and 0.8% SS , GMD for BB (B and B.reg) air masses.



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



**Table S1:** ANR and  $r^2$  values between (a)  $[\text{NH}_4^+]$  and  $[\text{SO}_4^{2-}]$ , (b)  $[\text{ns-NH}_4^+]$  and  $[\text{Cl}^-]$ , (c)  $[\text{ns-NH}_4^+]$  and  $[\text{NO}_3^-]$  and  $[\text{ns-NH}_4^+]$  and (d)  $[\text{Cl}^- + \text{NO}_3^-]$  for all air masses.

Cluster	ANR	$r^2_{\text{NH}_4^+/\text{SO}_4}$	$r^2_{\text{ns-NH}_4^+/\text{Cl}^-}$	$r^2_{\text{ns-NH}_4^+/\text{NO}_3^-}$	$r^2_{\text{ns-NH}_4^+/[\text{Cl}^- + \text{NO}_3^-]}$
A	0.95	0.78	0.71	0.45	0.84
BB	0.91	0.75	0.43	0.50	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	0.27	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 ( $\text{cm}^{-3}$ ), 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