Cloud condensation nuclei from fresh and aged air pollution in the megacity region of Beijing: size-resolved measurements and parameterization of aerosol chemical composition, hygroscopicity and CCN activity

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Table S1: Characteristic CCN parameters (median values) listed for entire campaign and for the focus periods of aged regional pollution and of fresh city pollution: midpoint activation diameters (D_a, D_t), maximum activated fractions (MAF_f, MAF_m), heterogeneity parameters (σ_a/D_a, σ_t/D_t), hygroscopicity parameters (κ_a, κ_t), number concentrations of total aerosol particles ($N_{CN,tot}$) and with D > 30 nm ($N_{CN,30}$), number concentrations of cloud condensation nuclei ($N_{CCN,S}$), integral CCN efficiencies ($N_{CCN,S}/N_{CN,tot}$, $N_{CCN,S}/N_{CN,30}$), n_{ES} are the numbers of averaged CCN efficiency spectra and size distributions respectively. Subscripts a and t stand for parameters derived from 3-parameter and 2-parameter CDF fits to the measured CCN efficiency spectra, respectively. The last section of the table shows data from the PRIDE-PRD2006 campaign (entire campaign excluding biomass burning event, Rose et al., 2010a).

S [%]	D_a [nm]	D_t [nm]	MAF_f	MAF_m	σ_a [nm]	σ_t [nm]	σ_a/D_a	σ_t/D_t	κ_a	κ_t	$N_{CN,tot}$ [10^3 cm^{-3}]	$N_{CN,30}$ [10^3 cm^{-3}]	$N_{CCN,S}$ [10^3 cm^{-3}]	$N_{CCN,S}/N_{CN,tot}$	$N_{CCN,S}/N_{CN,30}$	n_{ES}
Entire campaign																
0.07	190.4	196.5	0.84	0.85	10.4	25.3	0.055	0.128	0.47	0.43	13.59	11.13	1.54	0.11	0.14	269
0.26	85.0	87.0	0.92	0.93	6.6	9.0	0.077	0.111	0.32	0.30	14.16	11.00	5.58	0.44	0.52	285
0.46	61.5	61.9	0.95	0.96	4.9	5.1	0.077	0.082	0.28	0.27	14.27	11.10	7.23	0.59	0.70	271
0.66	51.5	52.3	0.95	0.97	5.0	6.1	0.096	0.117	0.23	0.22	14.00	11.07	7.94	0.67	0.78	278
0.86	44.1	44.4	0.97	0.98	4.7	4.9	0.103	0.110	0.22	0.21	14.03	11.10	9.34	0.75	0.86	269
All							**0.080**	**0.110**	**0.30**	**0.28**	**14.00**	**11.00**				**1372**
Aged regional pollution																
0.07	186.3	186.8	0.91	0.95	6.3	8.7	0.033	0.046	0.49	0.48	12.14	11.02	2.39	0.20	0.22	34
0.26	81.2	82.9	0.96	0.96	6.6	8.2	0.084	0.101	0.37	0.35	12.41	11.37	7.29	0.61	0.66	33
0.46	59.9	60.4	0.97	0.97	4.3	4.3	0.071	0.072	0.30	0.30	12.43	10.93	8.75	0.74	0.81	34
0.66	49.3	50.3	0.95	0.97	4.5	5.2	0.091	0.102	0.26	0.25	11.87	10.86	9.31	0.82	0.89	34
0.86	43.6	43.6	0.97	0.98	5.2	5.4	0.118	0.120	0.22	0.22	12.34	11.15	10.02	0.85	0.93	34
All							**0.079**	**0.093**	**0.33**	**0.32**	**12.24**	**11.06**				**169**
Fresh city pollution																
0.07	204.1	236.9	0.68	0.70	18.4	48.3	0.086	0.236	0.36	0.23	19.97	12.09	0.40	0.02	0.03	269
0.26	95.3	105.6	0.91	0.92	14.6	28.3	0.144	0.263	0.23	0.17	20.05	11.17	2.08	0.12	0.20	285
0.46	75.3	79.3	0.93	0.95	10.7	14.2	0.149	0.168	0.15	0.13	19.93	11.11	3.29	0.19	0.33	271
0.66	58.2	59.8	0.95	0.96	9.3	10.3	0.155	0.181	0.160	0.15	19.73	11.18	4.41	0.30	0.46	278
0.86	48.3	48.5	0.96	0.99	5.9	6.5	0.114	0.133	0.16	0.16	19.77	11.48	5.80	0.42	0.56	269
All							**0.128**	**0.190**	**0.21**	**0.16**	**19.88**	**11.41**				**181**
PRIDE-PRD2006 Entire campaign excluding BBE (from Rose et al., 2010a)																
0.068	187.4	210.5	0.72	0.74	14.3	58.6	0.08	0.28	0.450	0.317	17.66	0.73		0.04		378-282
0.27	78.2	82.1	0.89	0.94	6.0	10.1	0.08	0.12	0.393	0.339	17.86	5.96		0.33		378-282
0.47	57.7	58.6	0.95	0.98	4.4	5.0	0.07	0.08	0.322	0.308	17.90	9.40		0.54		385-291
0.67	47.4	48.0	0.96	1.00	3.5	4.4	0.08	0.09	0.285	0.275	17.27	10.50		0.62		275-208
0.87	40.1	40.2	0.99	1.01	3.8	4.1	0.09	0.10	0.280	0.278	18.14	12.91		0.73		374-282

Table S2: Best-fit parameters of monomodal lognormal size distribution functions fitted to the median size distribution of aerosol particles (CN) for the entire campaign and focus periods (aged regional pollution, fresh city pollution): integral number concentration (N_{CN}), count median or geometric mean diameter (D_g), and geometric standard deviation (σ_g). Last row represents the lognormal size distribution parameters fitted to the median number size distribution observed during PRIDE-PRD2006 (entire campaign excluding biomass burning episode, Rose et al., 2010a).

Period	N_{CN} **[cm^{-3}]**	D_g **[nm]**	σ_g
Entire campaign	10200	94	2.1
Aged Regional Pollution	10300	125	1.9
Fresh City Pollution	16100	53	1.7
PRIDE-PRD2006 (entire campaign excl. BBE)	18638	68	1.9

Table S3: Mass concentrations and corresponding mass fractions of organic matter and inorganic ions determined by aerosol mass spectrometry (AMS). Apparent elemental and organic carbon (EC_a, OC) mass concentrations determined by thermo-optical measurements and mass fractions of EC and OC relative to the estimated total concentration of fine particulate matter (PM1 ≈ ΣAMS+EC). Median values are listed for the entire campaign and for the focus periods of aged regional pollution and of fresh city pollution.

Compound	Mass Concentration (μg m^{-3})			Mass Fraction		
	Entire Campaign	Aged Regional Pollution	Fresh City Pollution	Entire Campaign	Aged Regional Pollution	Fresh City Pollution
Organics	9.78	14.08	5.83	0.374	0.301	0.720
SO_4	7.93	17.83	0.98	0.303	0.382	0.121
NH4	5.24	8.29	0.59	0.200	0.177	0.073
NO3	2.68	5.28	0.55	0.102	0.113	0.068
Chlorine	0.54	1.22	0.15	0.021	0.026	0.018
∑AMS	26.2	46.7	8.1	1.00	1.00	1.00
EC	4.3	4.7	2.1	0.14	0.09	0.21
OC	5.7	6.4	3.6	0.19	0.12	0.35
∑AMS+EC	30.5	51.4	10.2	1.00	1.00	1.00