Supplementary Information

Multi-Year ACSM measurements at the Central European Research Station Melpitz (Germany) part I: Instrument Robustness, Quality 5 Assurance, and Impact of Upper Size Cut-Off Diameter

L. Poulain¹, G. Spindler¹, A. Grüner¹, T. Tuch¹, B. Stieger¹, D. van Pinxteren, H. Herrmann¹, and A. Wiedensohler¹

¹ Leibniz Institute for Tropospheric Research (TROPOS), Permoserstr. 15, 04317 Leipzig, Germany

10 Correspondence to: L. Poulain (poulain@tropos.de)

Table SI-1: Fitting parameters of the comparison of the mass concentrations measured by the ACSM and offline PM₁ considering the identified threshold PM₁:PM_{2.5} < 0.6 or the entire PM₁ dataset.

		PM ₁ (threshold PM ₁ :PM _{2.5} < 0.6)			PM ₁ no threshold		
species	Time period	Slope	Intercept	R ²	Slope	Intercept	R ²
Total mass	All dataset	1.02	-4.21	0.90	1.29	-6.64	0.72
	Winter	1.01	-3.27	0.87	1.3	-5.44	0.77
	Spring	1.01	-2.82	0.89	0.97	-2.85	0.83
	Summer	0.89	-3.59	0.40	0.9	-3.54	0.35
	Fall	1.31	-6.83	0.67	1.55	-8.79	0.58
Sulfate	All dataset	0.96	-0.06	0.77	1.45	-0.63	0.59
	Winter	0.98	-0.06	0.83	1.57	-0.43	0.61
	Spring	1.01	-0.14	0.72	0.98	-0.08	0.74
	Summer	0.85	0.00	0.80	0.87	-0.01	0.77
	Fall	1.06	-0.06	0.54	1.25	-0.29	0.58
Nitrate	All dataset	0.65	0.65	0.80	1.32	0.6	0.79
	Winter	1.29	0.04	0.80	1.49	-0.06	0.74
	Spring	1.05	0.88	0.82	1.09	0.85	0.81
	Summer	6.28	-0.29	0.29	6.47	-0.35	0.27
	Fall	1.63	0.55	0.51	1.9	0.39	0.56
Ammonium	All dataset	1.14	-0.05	0.77	1.40	-0.21	0.71
	Winter	1.02	0.08	0.83	1.36	-0.09	0.65
	Spring	1.15	-0.02	0.79	1.15	-0.01	0.80
	Summer	1.47	-0.37	0.49	1.53	-0.39	0.51
	Fall	1.74	-0.31	0.44	2.01	-0.49	0.46
Organic (OM _{ACSM})	All dataset	1.71	0.11	0.68	1.85	-0.1	0.74
	Winter	1.29	0.28	0.78	1.70	-0.29	0.76
	Spring	1.84	0.02	0.81	1.89	-0.1	0.79
	Summer	2.74	-1.44	0.68	2.83	-1.58	0.66
	Fall	2.49	-1.07	0.69	2.41	-1.06	0.67

Figure SI-1: Time series ACSM (daily average, black line) and daily 24 h $\text{PM}_{2.5}$ filter samples (colored bars) for the total mass, sulfate, nitrate, and ammonium. The particulate matter (PM) corresponds to the sum of ACSM species and eBC_{PM1} for the on-line instrument and the filter mass for the off-line samples.

Figure SI-2: Scatter plot of the ACSM mass measurements compared to daily mass in $\text{PM}_{2.5}$.

Figure SI-3: Seasonal variability of the $PM_1:PM_{2.5}$ ratios of total PM (a), nitrate (b), sulfate (c) and OC (d).

Figure SI-4: Influence of coarse mode particles on particle number and volume size distribution in the range 10 to 5000 nm obtained by merging MPSS and APSS (assuming spherical particle and a constant density of 1.6). The top panels represent the daily median particle number (black full line) and volume (red dots) size distribution for selected days emphasized by the white box on the particle volume size distribution from February 2017. The dashed black lines on the plots indicate the upper size bin of the MPSS.

Figure SI-5: Scatter plot of the winter (DJF) ACSM nitrate mass concentration corrected from organo-nitrate contribution compared to off-line PM_1 filter samples for days with a $PM_1:PM_{2.5} < 0.6$.

Figure SI-6: influence of the maximum day temperature to the $OC_{ACSM}:OC_{PM_1}$ ratio.

Figure SI-7: Time series of the Digital PM₁ chemical composition.