Supplementary material AMT-2019-499

Station Acronym	Instrument	Data availability					Aerosol Absorption Coefficient σ_{ap} (Mm^{-1})														
							Year			DJF			MAM			JJA			SON		
		Year	DJF	MAM	JJA	SON	Med.	$q10^{th}$	$q90^{th}$	Med.	$q10^{th}$	$q90^{th}$	Med.	$q10^{th}$	$q90^{th}$	Med.	$q10^{th}$	$q90^{th}$	Med.	$q10^{th}$	$q90^{th}$
ALT	AE31	82%	84%	84%	80%	82%	0.41	0.02	1.98	0.77	0.16	2.97	1.23	0.33	2.25	0.11	-0.04	0.41	0.24	0.01	0.66
AMY	AE31	75%	100%	100%	46%	57%	4.24	1.89	10.65	4.81	2.22	11.94	5	2.19	11.45						
APP	CLAP-3W	97%	97%	98%	93%	98%	1.5	0.49	3.12	1.34	0.44	3.15	1.3	0.44	3.38	1.69	0.78	3.04	1.57	0.48	3.06
APT	MAAP	94%	100%	100%	77%	100%	0.59	0.16	2.44	0.86	0.23	4.95	0.5	0.15	1.35	0.46	0.11	1.45	0.56	0.2	3.43
ARN	CLAP-3W	70%	34%	73%	94%	78%										2.66	1.07	6.64	2.93	1.11	7.33
BEO	CLAP-3W	54%	14%	42%	66%	95%													0.41	0.05	2.38
BIR	PSAP-3W	68%	94%	65%	21%	91%				0.66	0.1	3.61							0.49	0.09	2.69
BKT	AE31	46%	75%	61%	0%	50%				2.73	0.61	6.31									
BND	CLAP-3W	91%	96%	90%	95%	84%	1.8	0.55	3.96	1.5	0.42	3.79	1.34	0.46	3.2	2.2	0.82	4.32	2.22	0.84	4.4
BRW*	CLAP-3W	42%	57%	75%	35%	0%	0.15	0.02	0.48	0.19	0.07	0.67	0.22	0.05	0.49	0.03	0	0.11			
CGO	MAAP	97%	91%	100%	100%	98%	0.05	0.01	0.51	0.03	0	0.14	0.1	0	1.68	0.03	0	0.37	0.06	0.01	0.39
CHC	AE31	98%	98%	97%	99%	98%	0.87	0.09	3.01	0.52	0.03	1.95	0.54	0.05	1.96	1.23	0.27	3.57	1.36	0.33	3.89
CMN	MAAP	93%	100%	90%	95%	88%	0.79	0.11	3.18	0.23	0.07	1.1	1.02	0.22	3.49	2.11	0.55	4.25	0.59	0.13	2.12
CPR*	CLAP-3W	85%	93%	99%	95%	52%	0.37	-0.01	1.54	0.34	-0.06	2.6	0.28	-0.04	1.46	0.44	0.02	1.16			
EGB	CLAP-3W	85%	94%	64%	97%	86%	1.14	0.3	3.51	0.91	0.3	3.1				1.5	0.42	3.81	1.37	0.28	4.03
ETL	CLAP-3W	69%	76%	74%	70%	55%				0.38	0.24	0.85									
GSN	CLAP-3W	33%	19%	85%	27%	0%							5.79	2.48	13.35						
HAC	AE31	85%	91%	71%	81%	99%	0.46	0.03	1.69	0.1	0	0.55				1.22	0.45	2.68	0.39	0.03	1.19
HPB	MAAP	96%	99%	99%	100%	87%	1.52	0.43	3.87	1.54	0.38	5.95	1.69	0.45	3.6	1.47	0.49	3.55	1.37	0.41	3.41
IPR	AE31	94%	90%	98%	90%	99%	6.73	1.47	30.66	17.32	2.55	48.16	5.04	1.49	15.89	4.53	1.33	8.72	10.41	1.2	32.28
IZO	MAAP	55%	45%	84%	91%	0%							0.41	0.1	2.36	0.54	0.08	3.14			
JFJ	MAAP	88%	84%	99%	100%	69%	0.09	0.02	0.56	0.04	0.01	0.17	0.11	0.02	0.54	0.25	0.03	0.81			
KOS	AE31	79%	87%	93%	60%	75%	5.12	2.11	17.94	10.51	2.77	29.23	4.45	1.98	10.12				6.99	2.6	16.27
KPS*	CLAP-3W	73%	91%	95%	65%	44%				8.47	2.49	19.84	3.89	1.78	9.06						
LEI	MAAP	98%	100%	100%	100%	92%	3.34	1.24	12.58	4.99	1.37	25.18	3.14	1.18	8.6	2.61	1.24	6.28	3.76	1.27	11.96
LEI-E	MAAP	94%	78%	99%	100%	100%	7.74	2.7	19.29	10.14	2.32	32.27	7.69	2.91	15.73	7.95	3.15	17.18	6.59	2.36	17.32
LEI-M	MAAP	76%	100%	100%	70%	35%	10.46	4.16	23.59	12.87	4.15	34.61	9.7	4.15	18.37						
LLN	PSAP-3W	93%	83%	93%	99%	95%	0.66	0.04	5.73	0.62	0.06	4.16	3.6	0.27	10.98	0.34	0.02	1.52	0.44	0.03	2.22
MEL	MAAP	99%	97%	99%	100%	98%	2.01	0.69	8.25	3.75	0.89	20.8	2.05	0.65	5.32	1.39	0.61	2.88	2.25	0.7	7.28
MLO*	CLAP-3W	44%	49%	33%	38%	54%	0.07	-0.04	0.33	0.05	-0.02	0.23	0.22	0.03	0.59	0.04	-0.07	0.25	0.06	-0.04	0.22
MSA	MAAP	66%	48%	73%	75%	67%										1.52	0.29	3.52			
MSY	MAAP	84%	46%	93%	98%	97%	2.21	0.64	4.98				1.95	0.61	4.55	2.56	0.86	4.95	2.3	0.63	4.96
NGL	MAAP	95%	96%	97%	94%	92%	0.24	0.07	1.09	0.42	0.09	2.8	0.2	0.06	0.63	0.16	0.07	0.41	0.29	0.09	1.15
NMY	MAAP	100%	100%	100%	100%	100%	0.01	0	0.03	0.01	0	0.03	0.01	-0.01	0.02	0.01	-0.01	0.02	0.02	0	0.04
OPE	AE31	75%	38%	90%	88%	83%	1.35	0.46	3.2				1.43	0.5	2.82	1.11	0.43	2.61	1.47	0.43	3.8
PAL	MAAP	81%	55%	100%	90%	78%	0.13	0.02	0.5				0.17	0.04	0.53	0.14	0.02	0.54	0.07	0	0.35
PDI*	AE31	84%	94%	85%	94%	62%	4.99	0.83	32.24	7.93	3.37	18.44	23.52	4.03	57.61	1.32	0.42	3.58			

Table SM1: Overview of Aerosol Absorption Coefficient measurements. For each site, the instrument used for data collection and corresponding data availability are indicated. The statistics, i.e. median, 10th and 90th quantiles of s_{ap} are only reported when data availability is above 75% over the period of interest (year or season). For MLO and BRW, where data are screening for provenance from clean air sectors, summary statistics is reported regardless of the data coverage. * 2016 data was used for these sites

Station Acronym	Instrument	Data availability					Aerosol Scatterin Coefficient σ_{sp} (Mm^{-1})														
		Year	DJF	MAM	JJA	SON	Year			DJF			MAM			JJA			SON		
							Med.	$q10^{th}$	$q90^{th}$	Med.	$q10^{th}$	$q90^{th}$	Med.	$q10^{th}$	$q90^{th}$	Med.	$q10^{th}$	$q90^{th}$	Med.	$q10^{th}$	$q90^{th}$
ALT	TSI 3563	75%	61%	83%	78%	79%	2.06	0.32	8.71				5.37	1.59	12.96	0.74	0.13	2.28	1.37	0.26	3.66
AMY	TSI 3563	45%	61%	92%	25%	1%							72.88	29.36	210.43						
APP	TSI 3563	98%	98%	98%	97%	99%	19.12	5.19	47.29	15.65	4.27	38.05	16.32	4.07	44.41	29	12.11	61.08	16.59	4.23	40.81
ARN	TSI 3563	88%	97%	92%	88%	76%	32.66	13.8	74.21	34.09	12.18	86.71	28.09	13.33	57.27	36.1	16.24	82.72	32.78	13.03	65.52
BBE	NGN-2	48%	47%	76%	51%	19%							8.71	1.25	25.98						
BEO	TSI 3563	86%	72%	96%	81%	95%	8.12	0.59	44.77				12.02	1.24	38.84	29.54	3.58	60.72	5.04	0.54	29.33
BIR	TSI 3563	93%	91%	95%	89%	95%	5.11	1.1	18.78	3.93	0.79	23.69	5.41	1.19	18.47	6.74	2.63	16.36	4.02	0.85	22.02
BKT*	Aurora 3000	97%	98%	99%	96%	97%	20.82	4.75	87.31	32.75	5.84	98.85	45.06	8.37	123.83	19.68	5.34	51.14	10.94	2.64	25.44
BND	TSI 3563	92%	97%	92%	96%	84%	22.84	8.02	55.8	26.11	9.22	70.75	18.43	6.56	44.52	24.41	9.07	48.48	22.94	7.57	59.31
BRW*	TSI 3563	49%	58%	76%	38%	23%	5.3	0.79	21.3	7.41	2.29	22.36	4.85	0.92	17.76	1.95	0.4	11.24	7.19	1.03	42.01
CGO	Aurora 3000	99%	97%	100%	100%	100%	4.05	1.44	9.38	4.43	1.92	8.42	4.28	1.51	18.33	3.35	1.14	7.5	4.05	1.43	8.53
CHC	Aurora 3000	84%	84%	96%	85%	73%	16.72	7.16	39.72	16.01	10.1	33.86	12.29	3.34	30.89	16.02	4.29	39.16			
CMN	TSI 3563	69%	79%	32%	70%	94%				1.3	0.38	8.65							3.96	1.02	16.57
CPR*	TSI 3563	44%	85%	60%	7%	24%				32.4	17.09	65.96									
DEM	Aurora 3000	87%	93%	69%	92%	93%	38	15.91	76.94	34.46	13.39	76.68				49.73	26.65	88.08	32.44	13.6	59.04
EGB	TSI 3563	83%	100%	73%	72%	89%	13.24	3.98	48.65	13.63	3.97	59.94							13.35	3.56	48.01
ETL	TSI 3563	98%	100%	93%	99%	100%	6.84	1.98	24.95	5.29	2.13	13.73	6.29	2.16	11.91	14.01	3.64	44.88	5.96	1.25	31.76
FKL	Aurora 3000	78%	70%	77%	82%	83%	36.16	16.07	74.13				37.02	18.11	74.07	50.47	28.11	91.15	29.11	12.49	53.31
GBN	NGN-2	48%	18%	64%	88%	22%										11.11	4.1	26.29			
GSN*	TSI 3563	35%	37%	86%	17%	0%							104.13	32.66	250.41						
HAC	TSI 3563	81%	81%	52%	92%	98%	11.87	0.5	56.17	1.69	0.12	8.01				40.11	15.21	77.18	9.54	0.47	32.58
HPB	TSI 3563	86%	92%	90%	71%	90%	12.71	2.06	46.36	10.95	1.53	74.15	15.65	1.99	56.95				10.41	2.23	34.16
IPR	TSI 3563	96%	96%	98%	91%	98%	38.06	6.36	157.73	84.81	8.75	247.77	28.29	5.47	118.92	30.62	7.29	64.26	45.31	5.69	142.65
IZO	TSI 3563	53%	40%	82%	90%	0%							4.46	1.48	63.88	8.98	1.74	156.26			
JFJ	TSI 3563	93%	91%	82%	100%	99%	0.91	0.14	8.73	0.39	0.09	1.9	1.3	0.21	8.57	4.2	0.44	13.15	0.54	0.12	3.5
KOS	TSI 3563	72%	52%	89%	72%	76%							27.14	10.23	67.95				27.17	9.1	69.47
KPS	TSI 3563	68%	77%	68%	66%	60%				150	38.8	341.2									
LLN	TSI 3563	92%	86%	91%	96%	93%	8.28	0.72	74.19	6.75	0.75	60.93	42.33	2.57	136.1	4.7	0.58	28.2	5.7	0.59	39.81
MEL	TSI 3563	98%	100%	100%	99%	93%	18.79	7.3	74.33	34.63	6.88	153.09	20.98	8.53	48.52	14.84	7.36	29.36	16.67	6.01	50.98
MLO*	TSI 3563	45%	51%	34%	40%	54%	1.04	0.27	5.82	0.72	0.23	2.93	3.59	0.9	9.21	1.06	0.32	5.03	0.82	0.21	3.92
MSA	Aurora 3000	62%	50%	75%	57%	67%							19.02	3.4	57.12						
MSY	Aurora 3000	81%	42%	90%	97%	94%	24.24	6.82	54.44				18.16	6.26	44.25	30.46	10	56.95	25.47	7.17	52.43
NMY	TSI 3563	64%	55%	96%	88%	16%							1.5	0.6	5.44	1.4	0.46	5			
OPE*	Aurora 3000	73%	83%	98%	97%	12%				4.62	0.25	43.4	2.43	0.71	9.42	3.7	0.97	8.07			
PAL	TSI 3563	73%	80%	88%	75%	49%				3.52	0.56	11.28	5.99	1.93	12.79	8.35	2.29	27.58			
PAZ	NGN-2	63%	38%	66%	76%	70%										5	-3	20			
PDI	Aurora 3000	97%	95%	96%	99%	98%	35.17	4.72	166.54	53.51	6.84	164.71	98.56	28.31	282.97	11.93	1.47	43.61	25.63	6.68	125.93

Table SM2: Overview of Aerosol Scattering Coefficient measurements. For each site, the instrument used for data collection and corresponding data availability are indicated. The statistics, i.e. median, 10th and 90th quantiles of s_{sp} are only reported when data availability is above 75% over the period of interest (year or season). For SPO, MLO and BRW, where data are screening for provenance from clean air sectors, summary statistics is reported regardless of the data coverage. * 2016 data was used for these sites

Station Name	Instrument	Data availability					N_{tot} (cm^{-3})														
							Year			DJF			MAM			JJA			SON		
		Year	DJF	MAM	JJA	SON	Med.	10th per.	90th per.	Med.	10th per.	90th per.	Med.	10th per.	90th per.	Med.	10th per.	90th per.	Med.	10th per.	90th per.
Welgegund	MPSS	93%	87%	96%	97%	92%	3798	1369	14024	3513	1286	12806	3916	1401	12627	3755	1506	14292	4004	1286	16185
Mt. Waliguan*	CPC	55%	56%	98%	66%	0%	-	-	-	-	-	-	2021	735	5712	-	-	-	-	-	-
Anmyeon –do	MPSS	50%	34%	0%	67%	100%	-	-	-	-	-	-	-	-	-	-	-	-	4247	2257	7659
Gosan*	CPC	34%	39%	76%	21%	0%	-	-	-	-	-	-	2761	1439	5049	-	-	-	-	-	-
Lulin	CPC	89%	87%	94%	86%	89%	1106	388	2779	810	307	2034	1466	554	2661	1080	380	3214	1121	395	3238
Mount Chacaltaya	MPSS	82%	94%	89%	91%	52%	2644	578	15307	1246	410	5588	2252	526	13827	5483	1303	27475	-	-	-
Egbert	CPC	94%	100%	77%	100%	99%	2594	648	7295	2541	683	7126	1329	281	5071	2701	1120	6464	3893	913	9022
East Trout Lake	CPC	98%	100%	93%	100%	100%	1116	189	3328	731	135	2742	724	192	3592	1508	707	3723	1159	162	3533
Alert	CPC	84%	86%	87%	81%	83%	153	53	426	101	53	235	201	77	354	256	66	686	88	37	379
Barrow	CPC	49%	44%	54%	52%	48%	128	40	599	148	48	354	132	54	417	140	36	1038	107	26	623
Bondville	CPC	71%	68%	70%	59%	89%	-	-	-	-	-	-	-	-	-	-	-	-	2222	660	5848
Appalachian State University, Boone	CPC	86%	50%	97%	97%	99%	2555	1146	5309	-	-	-	2815	1146	6522	2339	1304	3984	2593	1070	5064
Trinidad Head	CPC	41%	66%	99%	1%	0%	-	-	-	-	-	-	628	251	1668	-	-	-	-	-	-
Steamboat Springs Colorado (Storm Peak Lab.)*	CPC	88%	89%	93%	92%	79%	2159	803	6709	1657	624	5005	2161	672	7562	2773	1410	8373	2062	905	6262
Cape San Juan*	CPC	61%	34%	31%	96%	84%	-	-	-	-	-	-	-	-	-	1153	629	2688	1372	721	3125
Cape Grim	CPC	87%	54%	94%	99%	100%	559	136	2797	-	-	-	722	166	3213	282	93	2847	583	170	2797
Mauna Loa	CPC	44%	49%	39%	44%	44%	409	280	696	414	280	749	376	275	642	438	304	694	408	254	708
Samoa (Cape Matatula)*	CPC	71%	65%	66%	74%	80%	-	-	-	-	-	-	-	-	-	-	-	-	330	221	431
Sonnblick	CPC	96%	100%	100%	84%	100%	1027	291	2562	636	189	1529	1223	417	3096	1737	720	2993	811	270	2093
BEO Moussala*	MPSS	38%	48%	91%	10%	2%	-	-	-	-	-	-	670	215	1864	-	-	-	-	-	-
Jungfraujoch	MPSS	85%	79%	74%	91%	98%	193	56	590	107	32	334	-	-	-	379	163	788	159	61	397
Kosetice	MPSS	95%	97%	93%	93%	96%	2690	1111	5159	2162	617	4849	2807	1323	5948	3371	2067	6131	2192	1117	3916
Prague-Suchdol	MPSS	89%	95%	97%	68%	95%	6077	2528	13129	5719	2022	12304	5132	2391	11641	-	-	-	6352	2906	13820
Waldhof	MPSS	94%	99%	86%	92%	98%	3350	1524	6309	2519	1103	5380	3701	1508	7501	4162	2193	7407	3110	1760	5301
Schauinsland	MPSS	93%	98%	84%	94%	96%	1873	491	4448	832	318	2009	2878	935	5671	2794	1281	5182	1599	518	3436
Neuglobsow	MPSS	96%	100%	89%	100%	97%	2579	1025	5507	1601	637	3145	2246	914	5247	3718	2055	7019	2892	1453	5266
Hohenpeissenberg	MPSS	69%	56%	86%	96%	38%	-	-	-	-	-	-	2872	1233	5011	3066	1458	5370	-	-	-
Melpitz	MPSS	94%	99%	100%	99%	79%	4434	2154	8361	3769	1727	6936	4602	2154	9538	5278	2871	11767	4154	2219	6643
Zugspitze-Schneefernerhaus	MPSS	66%	84%	92%	37%	53%	-	-	-	520	162	1496	1298	302	3425	-	-	-	-	-	-
Leipzig TROPOS	MPSS	88%	91%	89%	87%	84%	5088	2486	10182	4889	2120	9525	5114	2426	10303	5594	3080	12012	4697	2501	9346
Annaberg-Buchholz	MPSS	64%	95%	66%	24%	70%	-	-	-	4987	1622	17827	-	-	-	-	-	-	-	-	-
Dresden-Nord*	MPSS	77%	76%	84%	58%	91%	7962	4037	15213	7558	3471	15836	7414	4008	13749	-	-	-	8272	4025	15455
Dresden-Winckelmannstrasse	MPSS	70%	97%	77%	33%	75%	-	-	-	4414	1596	9953	4411	2335	10394	-	-	-	4097	1979	9051
Leipzig-Eisenbahnstrasse	MPSS	96%	94%	100%	100%	90%	8573	3859	18002	7233	2903	16737	9467	4862	17970	10375	5511	21266	6875	3289	14810
Leipzig-Mitte*	MPSS	86%	91%	94%	69%	87%	10130	4634	21699	9512	3759	22274	10556	5087	21435	-	-	-	11056	5146	22994
Deutschneudorf	MPSS	76%	74%	100%	99%	32%	3692	1513	10893	-	-	-	3813	1715	11181	4381	2059	17022	-	-	-
Madrid*	MPSS	57%	76%	52%	41%	59%	-	-	-	10217	2148	24345	-	-	-	-	-	-	-	-	-
El Arenosillo	CPC	55%	34%	59%	44%	82%	-	-	-	-	-	-	-	-	-	-	-	-	6332	3575	14475
Montseny	MPSS	88%	94%	97%	100%	59%	3007	1158	8261	1847	805	4712	3252	1407	8232	4247	1806	11519	-	-	-
Värriö	MPSS	98%	100%	96%	99%	98%	391	77	2027	178	48	554	624	142	2164	1355	273	2874	240	53	995
Hyytiälä	MPSS	94%	94%	91%	98%	93%	1259	430	3074	812	330	2006	1526	620	3865	2011	892	3735	928	336	2136

Table SM3: Overview of CN measurements. For each site, the instrument used for data collection and corresponding data availability are indicated. The statistics, i.e. median, 10th and 90th percentiles of N_{tot}, are only reported when data availability is above 75% over the period of interest (year or season).* 2016 data was used for these sites