Table S1: Nephelometer data correction

Observatory	correction	who	method	note
DEM	yes	data provider	Müller et al. (2011)	
BEO	yes	data provider	Anderson&Ogren (1998)	
BIR	yes	this work	Anderson&Ogren (1998)	
CBW	yes	data provider	Anderson&Ogren (1998)	
FKL	no			1-λ
UGR	yes	data provider	Anderson&Ogren (1998)	
HPB	yes	data provider	Anderson&Ogren (1998)	
SMR	yes	data provider	Anderson&Ogren (1998)	
IPR	yes	data provider	Anderson&Ogren (1998)	
IZO	yes	data provider	Anderson&Ogren (1998)	
JFJ	yes	data provider	Anderson&Ogren (1998)	
KPS	yes	data provider	Anderson&Ogren (1998)	
KOS	yes	this work	Anderson&Ogren (1998)	
MHD	yes	this work	Anderson&Ogren (1998)	
MAD	yes	data provider	Müller et al. (2011)	
MPZ	yes	this work	Anderson&Ogren (1998)	
MSA	yes	data provider	Müller et al. (2011)	
MSY	yes	data provider	Müller et al. (2011)	
CHC	yes	data provider	Müller et al. (2011)	
CMN	no			1-λ
OPE	yes	data provider	Müller et al. (2011)	
PAL	yes	data provider	Anderson&Ogren (1998)	
PLA	yes	this work	Anderson&Ogren (1998)	
PUY	yes	this work	Anderson&Ogren (1998)	
SIR	no			1-λ
TRL	yes	this work	Anderson&Ogren (1998)	
VHL	yes	data provider	Müller et al. (2011) (*)	
ZEP	yes	data provider	Anderson&Ogren (1998)	

(*) DMPS data and a Mie-theory code for 2008 and 2009.

Table S2: Number of RH hourly data; number and % of hourly RH data >50%; periods with σ_{sp} and RH reported data.

	# of RH data (hourly)	# of RH data >50% (hourly)	% of RH data >50%	period with σ_{sp} measurements	period with RH reported	note
SIR	8152	2306	28.3	2012 - 2013	2012 - 2013	Instrument internal
CMN	16305	2122	13.0	2007 - 2015	2013 - 2015	Instrument internal
IPR	71092	5993	8.4	2004 - 2014	2004 - 2014	RH controlled from 2009. Instrument internal
OPE	22641	1551	6.9	2012 - 2015	2012 - 2015	Outlet
MAD	6578	434	6.6	2014	2014	Instrument internal
MSY	37714	1498	3.9	2010 - 2015	2010 - 2015	Instrument internal
KPS	58558	2242	3.8	2006 - 2014	2006 - 2014	Instrument internal
PLA	3137	116	3.7	2013 - 2014	2013 - 2014	Instrument internal
KOS	15238	503	3.3	2013 - 2015	2013 - 2015	Instrument internal
MHD	94405	3012	3.2	2001 - 2013	2001 - 2013	Instrument internal
UGR	71135	2764	3.1	2006 - 2015	2006 - 2015	Instrument internal
HPB	79260	2150	2.7	2006 - 2015	2006 - 2015	Instrument internal
PUY	54241	1426	2.6	2007 - 2014	2007 - 2014	Instrument internal
VHL	9301	152	1.6	2008 - 2014	2012 - 2014	Inlet
BIR	48845	593	1.2	2009 - 2015	2009 - 2015	Instrument internal
CBW	37649	330	0.9	2008 - 2012	2008 - 2012	Instrument internal
FKL	39269	211	0.5	2004 - 2015	2011 - 2015	Instrument internal after 2011
DEM	24256	12	0.1	2012 - 2015	2012 - 2015	Instrument internal
MSA	20183	1	0.0	2013 - 2015	2013 - 2015	Instrument internal
PAL	76330	2	0.0	2000 - 2015	2000 – 2006; 2009; 2012 - 2015	Instrument internal
BEO	43718	0	0.0	2007 - 2015	2007; 2010 - 2015	Instrument internal
SMR	41364	0	0.0	2006 - 2015	2011 - 2015	Instrument internal
JFJ	131338	0	0.0	1995 - 2014	2000 - 2014	Instrument internal
MPZ	14464	0	0.0	2007 - 2015	2012 - 2015	Instrument internal
CHC	30910	0	0.0	2012 - 2015	2012 - 2015	Outlet
TRL	33309	0	0.0	2007 - 2015	2010 – 2011; 2014 - 2015	Instrument internal
ZEP	34516	0	0.0	2010 - 2014	2010 - 2014	Instrument internal
IZO	0			2008 - 2015		RH not reported

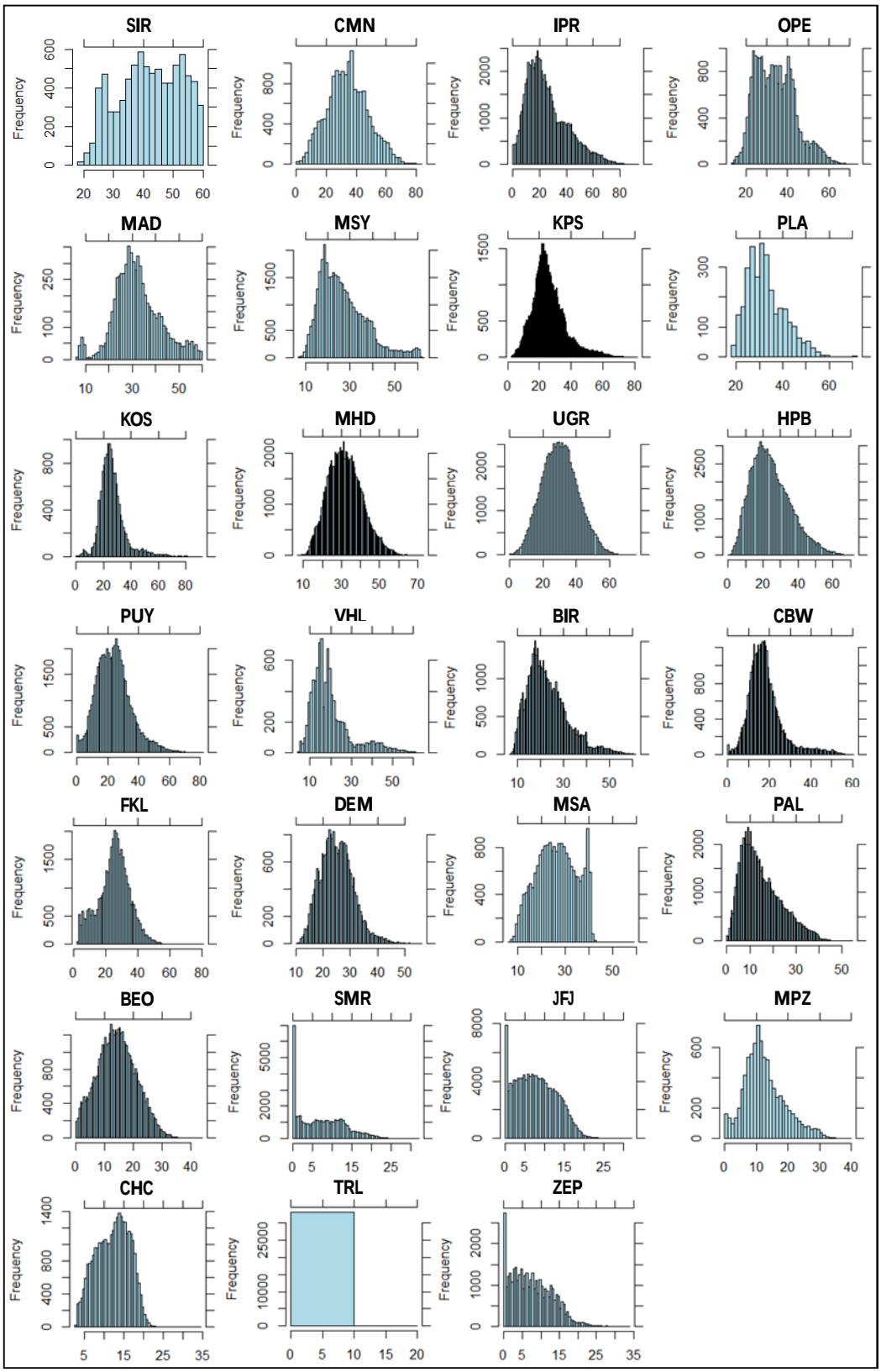

Figure S1: Frequency distributions of sampled RH at ACTRIS observatories.

Table S3: Percentage [%] of data coverage at the 28 ACTRIS stations included in this study

Station	# hours [1]	DATA COVERAGE [%] [$]							
		σ_{sp}1 [%] λ [nm]	σ_{sp} 2 [%] λ [nm]	σ_{sp} 3 [%] λ [nm]	σ_{bsp} 1 [%] λ [nm]	σ_{bsp} 2 [%] λ [nm]	σ_{bsp} 3 [%] λ [nm]	SAE [%] [2]	BF and g [%] [3] λ [nm]
nordic and Baltic									
Birkenes II **(BIR)**	56832	87.1 450	87.1 550	87.1 700	87.1 450	87.1 550	87.1 700	83.9	55.2 550
Hyytiala **(SMR)**	84035	93.7 450	93.7 550	93.7 700	88.8 450	88.8 550	88.8 700	93.1	71.7 550
Pallas **(PAL)**	140256	72.5 450	70.1 550	70.5 700	72.9 450	71.6 550	71.1 700	54.0	25.8 550
Vavihill **(VHL)**	50508	36.2 450	36.2 520	36.2 700 [4]				35.9 [5]	
Preila **(PLA)**	18264	16.5 450	16.5 550	16.5 700	9.9 450	9.9 550	9.9 700	16.5	9.9 550
western									
Mace Head **(MHD)**	109037	82.5 450	82.5 550	82.5 700	82.1 450	82.1 550	82.1 700	81.8	71.9 550
Cabauw **(CBW)**	43848	85.1 450	85.1 550	85.1 700	85.1 450	68.0 550	85.0 700	84.5	56.4 550
Sirta **(SIR)**	12731	64.0 450							
O.Perenne **(OPE)**	28956	72.8 450	72.8 525	72.8 635	44.3 450	68.8 525	68.8 635	74.0	59.0 525
Puy de Dome **(PUY)**	70128	70.1 450	71.0 550	71.1 700	68.5 450	68.5 550	68.5 700	59.3	42.6 550
central									
Hohenpeissenberg **(HPB)**	87648	87.8 450	87.8 550	87.8 700	87.8 450	87.8 550	87.8 700	77.3	64.1 550
Ispra **(IPR)**	96432	71.7 450	71.9 550	71.8 700	71.9 450	71.8 550	71.6 700	70.4	69.1 550
Melpitz **(MPZ)**	78224	94.6 450	96.0 550	94.7 700	86.2 450	86.3 550	86.5 700	94.5	85.2 550
Jungfraujoch **(JFJ)**	179545	84.2 450	84.2 550	84.2 700	83.8 450	83.8 550	83.8 700	53.9	21.8 550
Mt. Cimone **(CMN)**	72825	15.1 [**] 450	75.1 520 [6]	15.1 [**] 700	15.1 [**] 450	15.1 [**] 550	15.1 [**] 700	11.7 [**]	8.4 [**] 550
Kosetice **(KOS)**	24588	59.9 450	60.0 550	59.9 700	54.4 450	54.4 550	54.4 700	59.8	53.6 550
eastern									
Beo Moussala **(BEO)**	76764	73.4 450	73.4 550	73.4 700	71.3 450	71.3 550	71.3 700	63.6	46.8 550
K-Puszta **(KPS)**	75804	72.6 450	72.6 550	72.6 700	72.6 450	72.6 550	72.6 700	72.6	72.5 550
south-western									
Montsec **(MSA)**	26280	76.5 450	76.5 525	76.5 635	75.5 450	75.5 525	75.5 635	63.9	49.1 525
Izaña **(IZO)**	68381	54.6 450	54.6 550	54.6 700	46.0 450	46.0 550	46.0 700	51.7	26.8 550
Granada **(UGR)**	87648	69.0 450	69.0 550	69.0 700	68.1 450	68.1 550	68.1 700	69.0	67.8 550
Montseny	52584	67.8	67.8	67.9	62.8	62.8	62.9	65.0	65.4

(MSY)		450	525	635	450	525	635		525
Madrid **(MAD)**	8760	72.8 450	74.7 525	72.8 635	73.2 450	73.2 525	73.2 635	72.3	53.3 525
south-eastern									
Finokalia **(FKL)**	102622		69.7 532 (7)						
Athens **(DEM)**	35064	69.1 450	69.1 525 (8)	69.1 635 (9)	62.8 450	62.8 525	62.8 635	68.6 (10)	61.5 525
Arctic									
Zeppelin **(ZEP)**	38913	87.3 450	87.3 550	87.3 700	87.3 450	87.3 550	87.3 700	66.5	19.4 550
Antarctic									
Troll **(TRL)**	77712	72.1 450	72.1 550	72.1 700	64.5 450	64.5 550	64.5 700	21.2	1.1 550
America									
Mt. Chacaltaya **(CHC)**	35064	88.1 450	88.1 525	88.1 635	88.1 450	88.1 525	88.1 635	67.0	61.9 525

($) Data coverage referenced to # hours; The data coverage refers to scattering and backscattering measurements at RH<50%.
(**) Only available for the years 2014 and 2015;
(1) Total number of hours for the periods reported for each station in Table 1 in the paper.
(2) *SAE* calculated from linear estimation using 3 λ. *SAE* calculated from scattering data higher than 0.8 Mm^{-1}.
(3) *g* calculated from scattering and backscattering data higher than 0.8 Mm^{-1}.
(4) The scattering at 700 nm changed to scattering at 635 nm starting from 2010.
(5) The SAE was calculated as linear fit using 450-520-635 nm scattering for 2008 – 2009. Starting from 2010 SAE was calculated using 700 nm instead of 635 nm.
(6) 520 nm until March 2014. After March 2014 it changed to 550 nm.
(7) 532nm from 2004 to 2011; 550nm for 2012 – 2013. SAE and *g* not available.
(8) During 2012 the wavelengths are: 450, 520, 700 nm. From 2013 the wavelengths are: 450, 525, 635 nm.
(9) During 2012 the wavelengths are: 450, 520, 700 nm. From 2013 the wavelengths are: 450, 525, 635 nm.
(10) The SAE was calculated as linear fit using 450-520-700 nm scattering for 2012 and then using 450-525-635 nm.

Table S4: Statistics of the aerosol particle scattering coefficient [Mm^{-1}]. Statistics are reported for the whole period available at each station.

	λ	mean	SD	min	max	5th pc	25th pc	50th pc	75th pc	95th pc	skewness
nordic and Baltic											
BIR	550	16.61	23.29	-0.01	417.69	1.58	4.74	9.80	19.68	51.70	5.3
SMR	550	17.34	18.69	0.15	305.95	2.90	6.26	11.33	21.10	52.70	3.4
PAL	550	7.85	15.66	-2.15	1875.14	0.40	1.88	4.29	9.45	26.48	1.4
VHL	520	33.34	37.48	0.96	369.50	5.70	11.79	19.88	37.80	111.98	2.8
PLA	550	64.78	60.02	2.68	482.45	8.48	20.67	45.65	85.02	189.17	1.7
western											
MHD	550	28.43	29.02	0.05	470.28	4.61	10.93	19.83	35.57	80.20	3.4
CBW	550	31.49	41.34	0.25	621.13	2.76	7.35	17.36	39.46	105.36	3.7
SIR	450	25.34	32.81	0.01	715.91	1.24	6.90	14.83	28.24	91.42	3.8
OPE	525	29.04	38.03	0.01	386.42	1.17	6.60	16.01	33.92	103.72	3.0
PUY	550	18.11	24.84	-1.93	484.79	0.22	2.73	10.90	23.87	58.43	4.2
central											
HPB	550	30.17	35.45	0.12	522.88	2.30	8.47	19.07	37.41	100.47	2.9
IPR	550	95.03	108.69	0.27	3239.14	5.76	22.72	56.12	126.29	315.54	2.7
MPZ	550	59.07	67.33	0.23	784.67	8.62	19.13	35.46	72.31	191.41	3.1
JFJ	550	7.35	11.96	-2.38	308.40	0.15	0.89	2.41	8.10	32.18	3.4
CMN	520	21.36	25.84	-5.60	582.04	0.69	4.30	12.43	28.83	71.53	2.7
KOS	550	46.05	41.30	0.00	324.27	7.73	18.02	32.36	60.52	129.15	2.0
eastern											
BEO	550	19.00	23.75	-1.27	470.88	0.48	2.56	10.43	28.03	60.91	3.3
KPS	550	74.01	71.95	2.14	811.46	11.72	27.11	48.99	95.24	219.92	2.4
south-western											
MSA	525	20.65	22.35	-2.73	277.06	0.33	3.53	13.10	31.02	66.41	1.8
IZO	550	30.81	57.78	0.04	1233.41	0.99	2.85	7.32	33.80	131.32	4.8
UGR	550	55.21	44.43	-1.32	663.88	12.74	26.26	43.14	69.80	138.49	2.6
MSY	525	35.95	32.21	-1.48	539.71	4.06	14.44	28.27	47.81	92.55	2.8
MAD	525	25.30	22.91	-0.61	254.62	3.37	9.90	18.04	33.89	68.72	2.4
south-eastern											
FKL	532	33.50	23.24	0.19	759.50	7.04	17.30	28.94	44.55	74.14	3.4
DEM	525	56.15	37.93	-3.11	554.88	15.23	30.67	47.39	71.19	125.64	2.3
Arctic											
ZEP	550	4.42	5.69	-0.83	81.35	0.17	1.15	2.82	5.58	13.99	4.42
Antarctic											
TRL	550	1.36	2.88	-1.02	93.93	0.04	0.48	0.72	1.31	4.00	10.6
South America											
CHC	525	8.54	12.33	-1.59	205.14	0.05	1.40	4.94	10.62	30.06	2.8

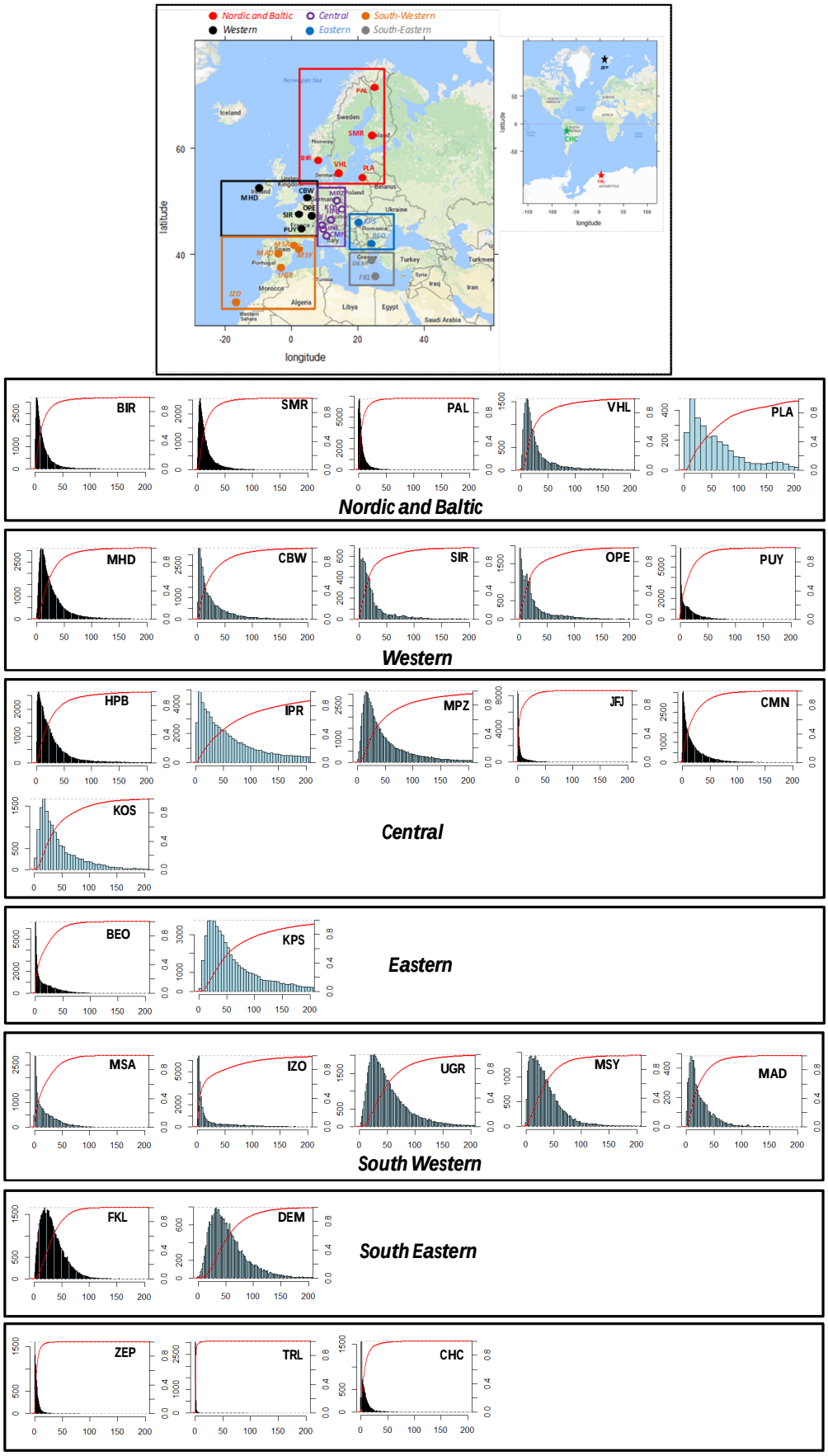

Figure S2: Frequency and cumulative frequency distributions of aerosol particle scattering coefficients.

Table S5: Statistics of the scattering Ångström exponent calculated as linear fit using the three nephelometer wavelengths (b-g-r). Statistics are reported for the whole period available at each station. The mean values of SAE calculated using the blue and the green wavelengths (b-g) and using the green and red wavelengths (g-r) are also reported. The reported SAE values were calculated for σ_{sp} > 0.8 Mm^{-1}.

	SAE (b-g-r)										SAE (b-g)	SAE (g-r)
	mean	SD	min	max	5th pc	25th pc	50th pc	75th pc	95th pc	skewness	mean	mean
nordic and Baltic												
BIR	1.49	0.60	-1.41	3.97	0.42	1.02	1.61	1.96	2.29	-0.41	1.43	1.53
SMR	1.75	0.50	-1.02	3.84	0.74	1.50	1.84	2.10	2.40	-0.83	1.71	1.78
PAL	1.63	0.67	-1.91	3.89	0.30	1.25	1.78	2.12	2.47	-0.79	1.58	1.67
VHL	1.27	0.68	-1.94	3.58	0.02	0.91	1.33	1.67	2.37	-0.26	1.38	1.24
PLA	1.45	0.56	-0.16	2.72	0.16	1.21	1.60	1.82	2.18	-0.97	1.51	1.41
western												
MHD	0.69	0.74	-1.99	5.80	-0.13	0.13	0.47	1.22	1.94	0.91	0.57	0.78
CBW	2.00	0.53	-0.20	3.62	0.84	1.81	2.12	2.34	2.61	-1.32	1.85	2.12
OPE	1.66	0.83	-1.71	4.97	0.21	1.16	1.70	2.24	2.85	-0.21	1.60	1.69
PUY	1.59	0.48	-1.06	4.62	0.60	1.36	1.69	1.91	2.18	-0.97	1.67	1.52
central												
HPB	1.85	0.37	-0.08	3.54	1.18	1.67	1.89	2.09	2.38	-0.84	1.82	1.88
IPR	1.96	0.30	-0.80	3.15	1.40	1.82	2.02	2.17	2.35	-1.36	1.83	2.07
MPZ	1.78	0.37	-0.21	5.59	1.06	1.59	1.83	2.03	2.27	-0.82	1.72	1.82
JFJ	1.90	0.70	-1.41	6.79	0.49	1.57	2.03	2.35	2.83	-0.74	1.80	1.99
CMN	2.00	0.58	-2.17	4.99	0.90	1.75	2.02	2.42	2.81	-0.94	1.94	2.06
KOS	1.79	0.29	-1.19	3.20	1.27	1.63	1.82	1.99	2.19	-1.09	1.80	1.78
eastern												
BEO	1.72	0.68	-2.48	3.84	0.27	1.42	1.94	2.18	2.46	-1.22	1.78	1.67
KPS	2.03	0.26	0.28	3.92	1.56	1.89	2.05	2.19	2.42	-0.72	1.88	2.14
south-western												
MSA	1.59	0.69	-1.48	5.14	0.26	1.30	1.65	1.96	2.58	-0.31	1.65	1.54
IZO	0.78	0.64	-1.97	3.71	-0.05	0.18	0.73	1.30	1.86	0.30	0.71	0.84
UGR	1.62	0.41	-1.35	5.96	0.82	1.39	1.69	1.91	2.17	-0.79	1.58	1.65
MSY	1.37	0.72	-1.56	5.71	0.12	0.99	1.40	1.76	2.41	0.04	1.36	1.38
MAD	1.43	0.54	-1.26	5.75	0.40	1.15	1.47	1.73	2.28	-0.29	1.56	1.32
south-eastern												
DEM	1.51	0.72	-2.51	5.13	0.20	1.12	1.60	1.99	2.49	-0.50	1.40	1.68
Arctic												
ZEP	1.16	0.62	-1.29	3.21	0.06	0.73	1.22	1.64	2.09	-0.28	1.11	1.20
Antarctic												
TRL	0.78	0.59	-1.40	3.09	-0.23	0.40	0.81	1.14	1.72	-0.05	0.94	0.64
South America												
CHC (a)	1.71	0.93	-2.92	5.92	0.26	1.35	1.72	2.09	3.05	-0.08	1.71	

(a) At CHC the statistics are reported for SAE calculated using the blue and green wavelengths.

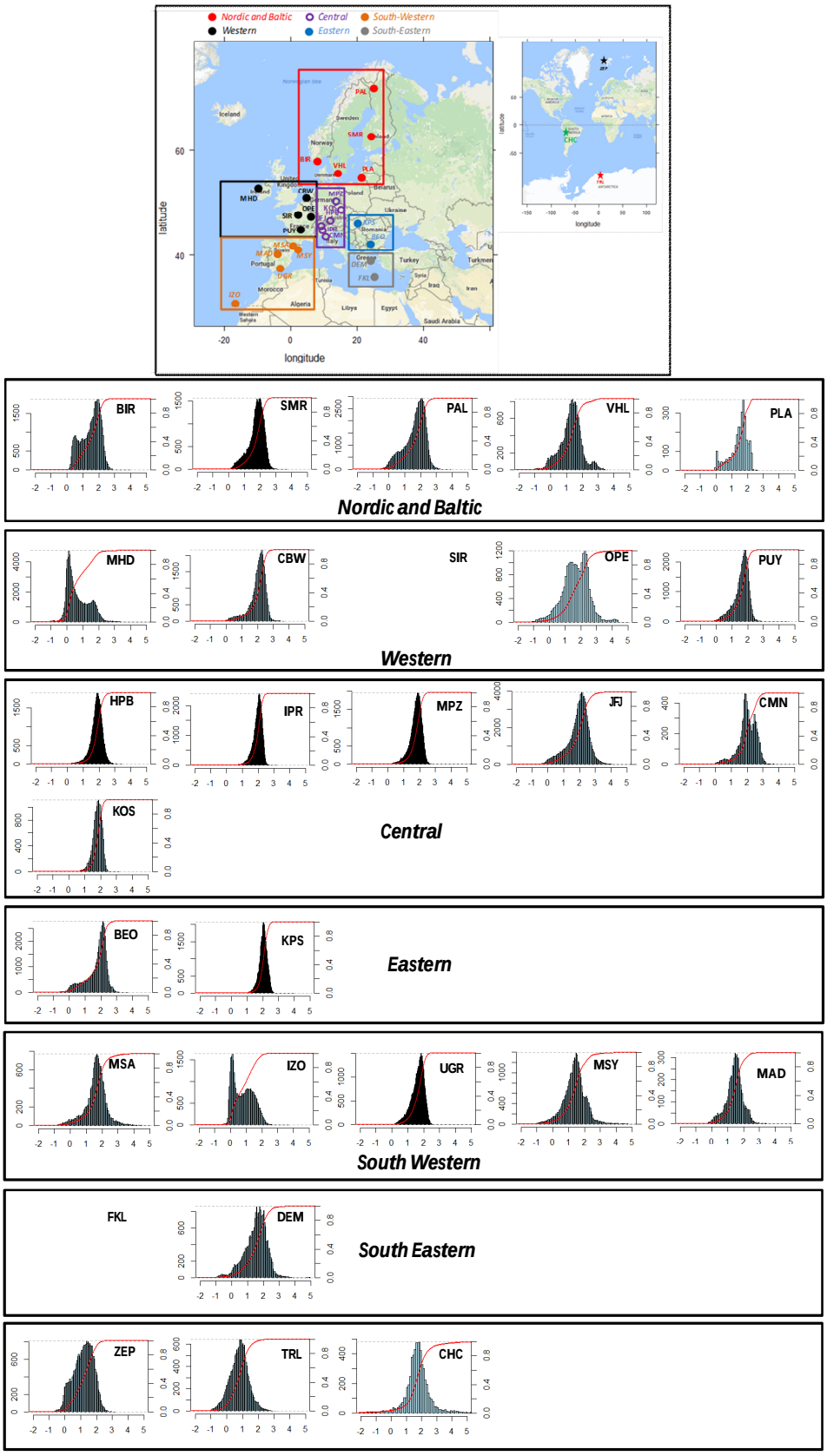

Figure S3: Frequency and cumulative frequency distributions of scattering Ångström exponent. SAE at CHC was calculated using the blue and green wavelengths.

Table S6: Statistics of the asymmetry parameter (calculated for the wavelengths reported in Table S2). Statistics are reported for the whole period available at each station. The reported *g* values were calculated for $\sigma_{sp} > 0.8$ Mm^{-1}.

	mean	SD	min	max	5th pc	25th pc	50th pc	75th pc	95th pc	skewness
nordic and Baltic										
BIR	0.626	0.065	0.119	0.856	0.518	0.584	0.627	0.674	0.724	-0.56
SMR	0.546	0.059	0.000	0.750	0.448	0.505	0.547	0.589	0.639	-0.19
PAL	0.586	0.079	-0.377	0.937	0.459	0.551	0.596	0.632	0.692	-1.59
PLA	0.649	0.035	0.479	0.711	0.590	0.626	0.651	0.677	0.697	-0.69
western										
MHD	0.642	0.049	0.052	0.974	0.562	0.619	0.648	0.669	0.709	-1.24
CBW	0.568	0.068	0.292	0.756	0.454	0.518	0.571	0.621	0.675	-0.20
OPE	0.559	0.142	-0.999	0.812	0.349	0.531	0.587	0.632	0.680	-4.33
PUY	0.606	0.054	0.007	0.869	0.520	0.574	0.608	0.639	0.692	-0.83
central										
HPB	0.609	0.055	0.116	0.871	0.519	0.572	0.608	0.646	0.701	-0.16
IPR	0.573	0.057	0.187	0.793	0.488	0.532	0.572	0.614	0.663	-0.36
MPZ	0.570	0.068	0.039	0.912	0.459	0.523	0.572	0.619	0.676	-0.27
JFJ	0.656	0.079	0.003	0.845	0.526	0.613	0.670	0.712	0.750	-1.76
CMN	0.493	0.051	0.083	0.797	0.416	0.460	0.494	0.528	0.573	-0.41
KOS	0.563	0.058	0.109	0.699	0.466	0.522	0.562	0.606	0.656	-0.17
eastern										
BEO	0.539	0.066	-0.769	0.737	0.441	0.510	0.546	0.578	0.624	-3.24
KPS	0.584	0.050	0.291	0.732	0.500	0.551	0.585	0.618	0.666	-0.16
south-western										
MSA	0.571	0.088	0.101	0.902	0.402	0.538	0.582	0.621	0.681	-1.44
IZO	0.607	0.047	-0.378	0.885	0.520	0.581	0.618	0.638	0.666	-1.40
UGR	0.547	0.045	-0.137	0.933	0.480	0.516	0.544	0.576	0.622	-0.16
MSY	0.589	0.062	-0.860	0.938	0.498	0.558	0.592	0.625	0.674	-1.73
MAD	0.523	0.072	0.118	0.814	0.419	0.481	0.525	0.572	0.624	-0.86
south-eastern										
DEM	0.643	0.088	-0.858	0.881	0.505	0.603	0.649	0.695	0.767	-1.97
Arctic										
ZEP	0.588	0.046	0.110	0.789	0.519	0.558	0.587	0.617	0.653	0.07
Antarctic										
TRO	0.696	0.056	0.277	0.769	0.592	0.688	0.711	0.726	0.742	-3.59
South America										
CHC	0.530	0.088	0.111	0.851	0.399	0.478	0.523	0.580	0.681	0.06

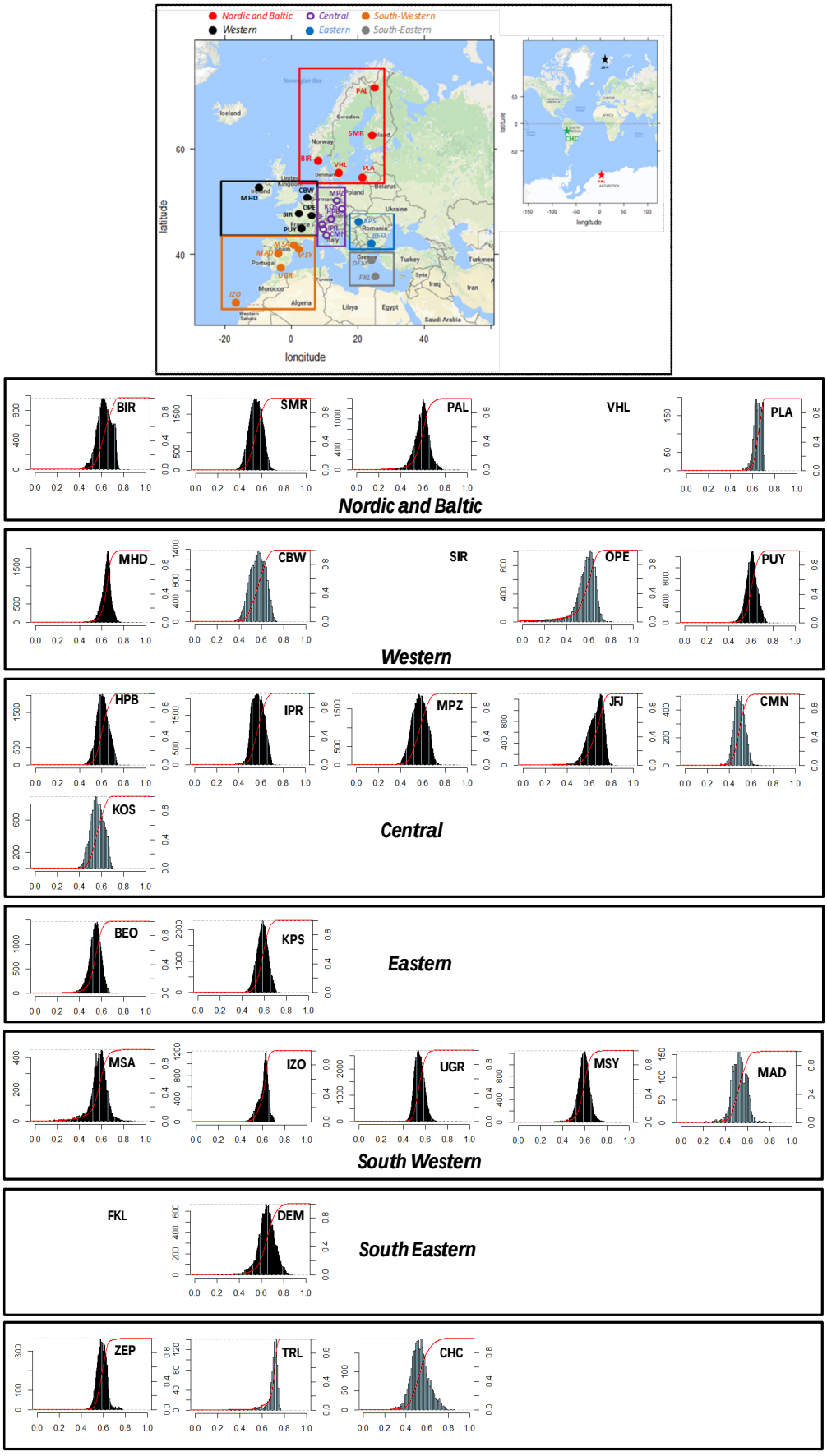

Figure S4: Frequency and cumulative frequency distributions of asymmetry parameter in the green wavelength.

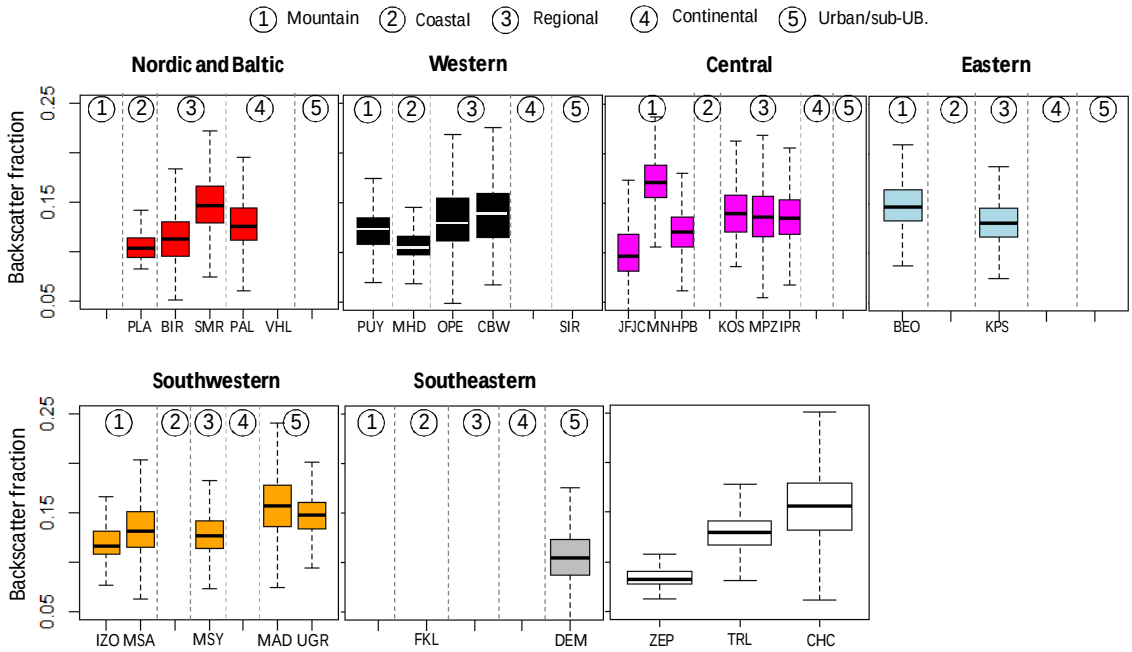

Figure S5: Backscatter fraction (BF) divided by geographical location. Medians (horizontal lines in the boxes), percentiles 25th and 75th (lower and upper limits of the boxes, respectively) and percentiles 5th and 95th (lower and upper limits of the vertical dashed lines) are reported. For each location data are ordered from mountain sites to urban/sub-urban sites.

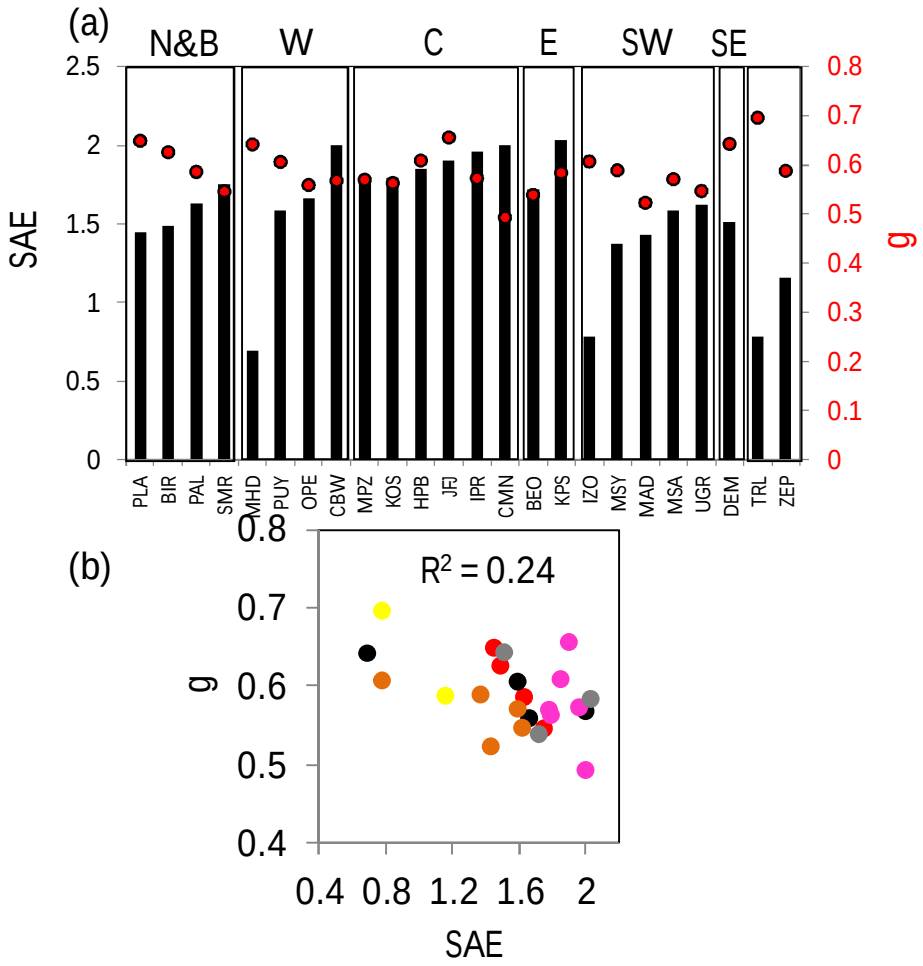

Figure S6: (a) SAE (bars) vs. *g* (dots) at all stations included in this work divided by geographical location: Nordic and Baltic (B&N), Western Europe (W), Central Europe (C), Eastern Europe (E), Southwestern Europe(SW), Southeastern Europe (SE), non-European stations (ZEP and TRL); and (b) SAE-*g* scatterplot (mean SAE and *g* values at each station used for the scatterplot). CHC not included because the SAE was calculated using the blue and green wavelengths.

Table S7: Statistics of the backscatter fraction (calculated for the wavelengths reported in Table S2). Statistics are reported for the whole period available at each station. The reported BF values were calculated for σ_{sp} > 0.8 Mm^{-1}.

	mean	SD	min	max	5th pc	25th pc	50th pc	75th pc	95th pc	skewness
nordic and Baltic										
BIR	0.115	0.027	0.036	0.607	0.077	0.095	0.113	0.130	0.160	1.36
SMR	0.149	0.027	0.069	0.490	0.109	0.129	0.147	0.166	0.195	0.55
PAL	0.132	0.038	0.013	0.645	0.089	0.111	0.125	0.145	0.189	2.76
PLA	0.105	0.014	0.082	0.179	0.087	0.094	0.104	0.113	0.128	0.89
western										
MHD	0.108	0.023	0.004	0.970	0.083	0.097	0.105	0.116	0.140	7.10
CBW	0.139	0.030	0.067	0.292	0.095	0.115	0.136	0.160	0.192	0.48
OPE	0.149	0.086	0.049	0.998	0.093	0.111	0.129	0.154	0.266	4.98
PUY	0.123	0.027	0.032	0.996	0.089	0.108	0.121	0.134	0.159	7.19
central										
HPB	0.121	0.023	0.032	0.418	0.085	0.105	0.120	0.135	0.159	0.52
IPR	0.136	0.025	0.055	0.368	0.099	0.118	0.135	0.153	0.174	0.85
MPZ	0.138	0.031	0.020	0.598	0.094	0.116	0.136	0.157	0.189	1.10
JFJ	0.104	0.034	0.039	0.488	0.069	0.081	0.096	0.118	0.156	3.24
CMN	0.173	0.026	0.054	0.440	0.135	0.155	0.171	0.188	0.213	1.05
KOS	0.141	0.026	0.086	0.422	0.102	0.121	0.140	0.158	0.185	0.48
eastern										
BEO	0.152	0.035	0.073	0.975	0.114	0.133	0.147	0.163	0.199	5.66
KPS	0.131	0.021	0.075	0.293	0.098	0.116	0.130	0.145	0.168	0.40
south-western										
MSA	0.140	0.048	0.023	0.489	0.093	0.115	0.131	0.151	0.224	2.90
IZO	0.121	0.020	0.028	0.645	0.098	0.108	0.116	0.131	0.159	2.17
UGR	0.147	0.021	0.015	0.558	0.115	0.134	0.148	0.161	0.178	1.01
MSY	0.129	0.028	0.013	0.763	0.095	0.114	0.127	0.141	0.169	3.05
MAD	0.160	0.036	0.049	0.417	0.114	0.135	0.157	0.178	0.211	1.84
south-eastern										
DEM	0.109	0.040	0.029	0.960	0.063	0.088	0.105	0.122	0.166	4.11
Arctic										
ZEP	0.130	0.019	0.056	0.422	0.103	0.117	0.129	0.142	0.159	0.84
Antarctic										
TRO	0.088	0.024	0.062	0.302	0.071	0.077	0.082	0.090	0.127	4.81
South America										
CHC	0.157	0.040	0.037	0.421	0.093	0.132	0.156	0.180	0.222	1.56

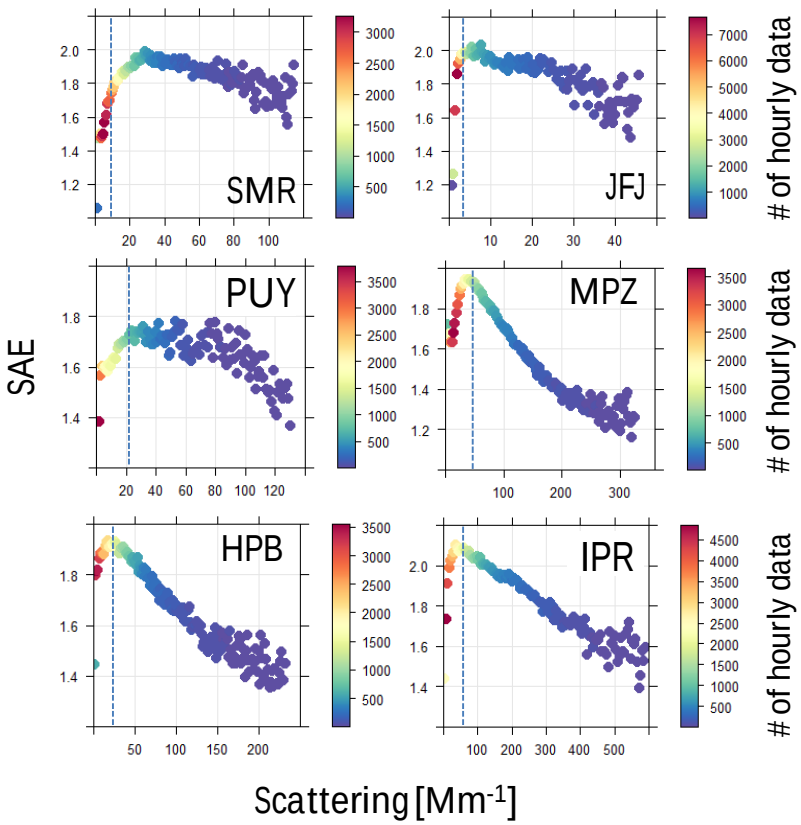

Figure S7: Relationships between SAE and scattering at some of the stations involved in this work. Points are colored by the number of samples in each bin. Dashed lines represent median σ_{sp} values at each station.

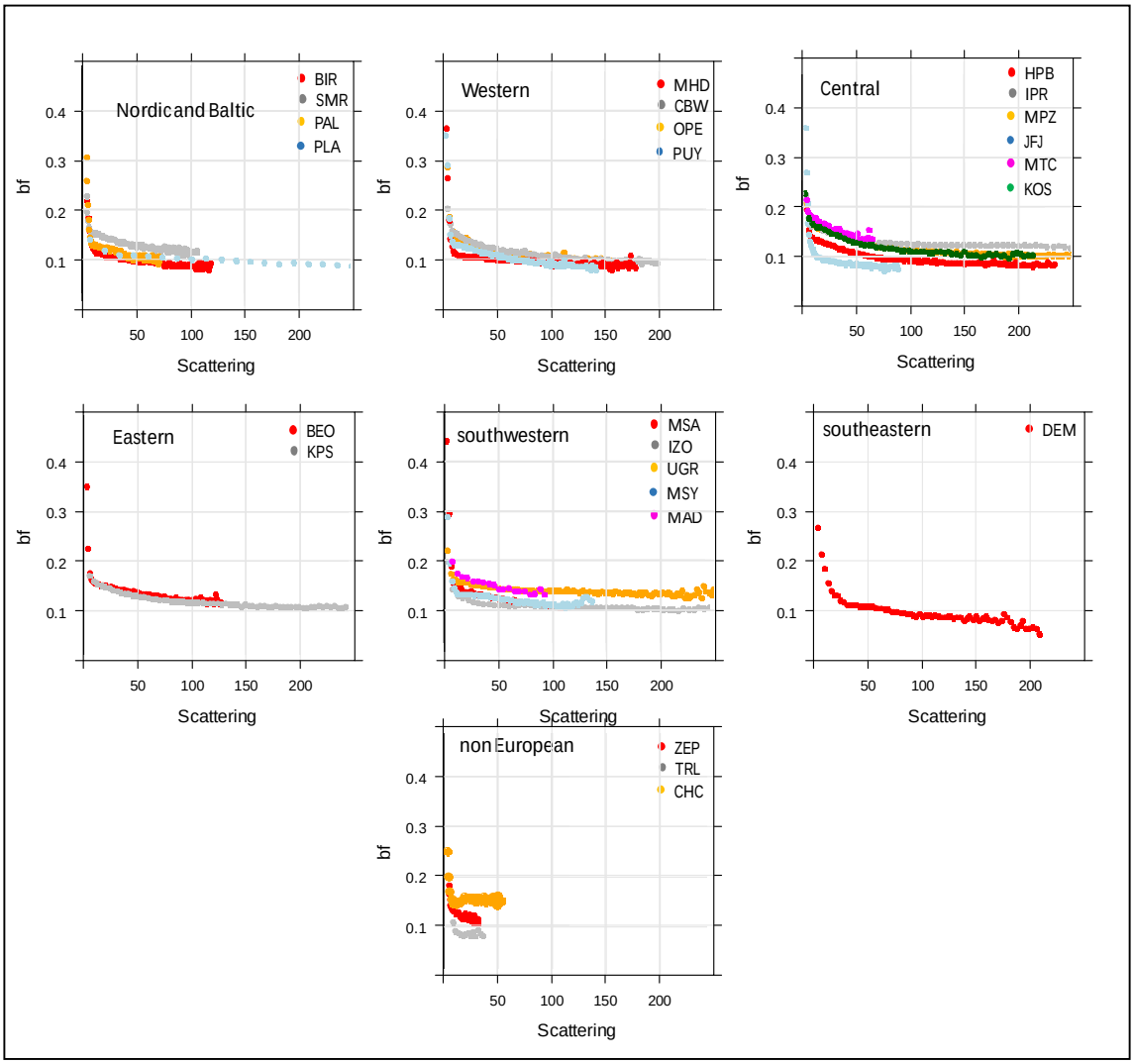

Figure S8: Scatterplots between scattering (x-axes) and backscatter fraction (bf; y-axes).

Table S8: Magnitude, p-value and total reduction (TR) of the trends of aerosol particle scattering coefficient (σ_{ap}), scattering Ångström exponent (SAE), and backscatter fraction (BF). Trend results are reported for the whole period available at each station until 2015 (**bold**) and for the periods considered in Collaud Coen et al. (2013) and in Asmi et al. (2013) (Cf. Table 2). Trends are considered as statistically significant if p-value < 0.05. Statistically significant increasing or decreasing trends are highlighted with red and green colour, respectively. Non-statistically significant increasing or decreasing trends are highlighted with grey colour. $: parameters removed in this work or in the work from Collaud Coen et al. (2013) because of measurement gaps, low data coverage or break points for one or more wavelengths. #: Only available for the period 2014-2015; ± not available. ××: available from 2008.

Station	*period*	σ_{ap}		*SAE*						*BF*	
				b-g-r		*b-g*		*g-r*			
		Magnitude (Mm^{-1}/year) [p-value]	*TR (%)*	*Magnitude ($year^{-1}$) [p-value]*	*TR (%)*	*Magnitude ($year^{-1}$) [p-value]*	*TR (%)*	*Magnitude ($year^{-1}$) [p-value]*	*TR (%)*	*Magnitude ($year^{-1}$) [p-value]*	*TR (%)*
PAL	**2000 - 2015**	**+0.017 [-0.067,0.120] p>0.05**	**+4.4**	**-0.019 [-0.029,-0.009] p<0.001**	**-17.3**	-0.007 [-0.015,0.003] p>0.05	+6.6	**-0.028 [-0.040,-0.015] p<0.001**	**-24.1**	**+0.0007 [0.0003,0.0013] P<0.001**	**+9.9**
	2000 - 2010	-0.225 [-0.362,-0.094] p<0.001	-33.9	-0.042 [-0.062,-0.026] P<0.001	-24.7	$	$	$	$	+0.001 [0,0.002] p>0.05	+7.6
	2001 - 2010	-0.149 [-0.333,+0.009] p>0.05	-24.7	-0.049 [-0.076,-0.032] P<0.001	-26.6	$	$	$	$	+0.001 [0,0.002] p>0.05	+7.8
SMR	**2006 - 2015**	**-0.588 [-0.962,-0.256] p<0.001**	**-30.3**	+0.008 [-0.004,0.018] p>0.05	+4.7	**+0.012 [0.001,0.021] P<0.05**	**+7.1**	+0.004 [-0.008,0.017] p>0.05	+2.4	**+0.0012 [0.0006,0.0019] p<0.001**	**+8.6**
MHD	**2001 - 2013**	-0.063 [-0.392,0.337] p>0.05	-2.9	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**
	2001 - 2010	+0.056 [-0.601,0.603] p>0.05	+2.0	$	$	$	$	$	$	$	$
PUY	**2007 - 2014**	-0.291 [-0.793,0.242] p>0.05	-13.0	**-0.031 [-0.050,-0.013] p<0.001**	**-14.9**	**-0.022 [-0.040,-0.006] P<0.05**	**-9.4**	**-0.022 [-0.043,-0.0003] P<0.05**	**-10.7**	**+0.0013 [0.0003,0.0022] P<0.01**	**+8.7**
HPB	**2006 - 2015**	**-1.376 [-2.007,-0.753] p<0.01**	**-38.0**	**+0.0098 [0.0014,0.0181] p<0.05**	**+5.5**	**+0.0075 [0.0005,0.0146] p<0.05**	**+4.3**	+0.0104 [0,0.0191] p>0.05	+5.8	**+0.0007 [0.0002,0.0013] p<0.05**	**+6.0**
IPR	**2004 - 2014**	**-5.357 [-7.034,-4.024] p<0.001**	**-48.0**	+0.0058 [0.0004,0.0118] p>0.05	+3.3	0.0003 [-0.0061,0.0086] p>0.05	+0.2	+0.0079 [0.0004,0.0160] p>0.05	+4.2	**+0.0009 [0.0003,0.0016] P<0.05**	**+7.7**
MPZ	**2007 - 2015**	-0.257 [-1.635,1.201] p>0.05	-4.3	-0.0001 [-0.0068,0.0062] p>0.05	-0.1	-0.0039 [-0.0111,0.0029] p>0.05	-2.0	-0.0004 [-0.0084,0.0065] p>0.05	-2.2	0.0009 [-0.0005,0.0023] p>0.05	+5.2
JFJ	**1995 - 2015**	-0.032 [-0.090,0.023] p>0.05	-10.2	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**
	1995 - 2010	0.076 [-0.009,0.1749] p>0.05	+20.9	$	$	$	$	$	$	$	$
	1996 - 2010	0.083 [-0.005,0.1732] p>0.05	+21.8	$	$	$	$	$	$	$	$
	2001 - 2010	-0.168 [-0.357,0.016] p>0.05	-21.4	$	$	$	$	$	$	$	$
	1997 - 2010	0.056 [-0.037,0.1522] p>0.05	+12.8	$	$	$	$	$	$	$	$
CMN	**2007 - 2015**	-0.481 [-1.136,0.508] p>0.05	-21.6	#	#	#	#	#	#	#	#
BEO	**2007 - 2015**	-0.093 [-0.055,0.396] p>0.05	-4.9	**-0.0474 [-0.0675,-0.0286] p<0.001**	**-22.0**	**-0.0201 [-0.0376,-0.0052] P<0.05**	**-9.7**	**-0.0688 [-0.914,-0.0484] P<0.001**	**-31.6**	-0.0001 [-0.001,0.002] p>0.05	-0.2
KPS	**2006 - 2014**	+0.623 [-0.479,1.791] p>0.05	+8.7	-0.0034 [-0.0121,0.0076] p>0.05	-1.5	**-0.0155 [-0.0228,-0.0072] P<0.001**	**-7.1**	+0.0069 [-0.0055,0.019] p>0.05	+2.9	+0.0001 [-0.0003,0.0007] p>0.05	+0.9
IZO	**2008 - 2015**	**-2.252 [-3.850,-0.856] p<0.01**	**-59.6**	+0.0198 [-0.0063,0.0476] p>0.05	+22.0	+0.0048 [-0.0220,0.0325] p>0.05	+5.1	+0.0229 [0,0.0561] p>0.05	+25.4	$	$
UGR	**2006 - 2015**	**-1.951 [-2.886,-1.141] p<0.001**	**-32.0**	**+0.0216 [0.0078,0.0358] p<0.001**	**+14.1**	+0.0105 [-0.0003,0.016] p>0.05	+6.7	**+0.0305 [0.0135,0.0452] p<0.001**	**+20.1**	**+0.0028 [0.0023,0.0033] p<0.001**	**+21.1**

Table S9: Magnitude and p-value for the trends of aerosol particle scattering coefficient and PM_{10} and/or $PM_{2.5}$ concentrations (PM mass concentration from www.ebas.nilu.no). Trend results are reported for common period at each station. Trends are considered as statistically significant if p-value < 0.05. Statistically significant decreasing trends are highlighted with green colour. Non statistically significant trends are highlighted with grey colour. NA: Not available for the considered period.

Station	*period*	*Aerosol particle scattering coefficient*		*PM_{10}*		*$PM_{2.5}$*	
		Magnitude [Mm^{-1}/year] p-value	*TR (%)*	*Magnitude [μgm^{-3}/year] p-value*	*TR (%)*	*Magnitude [μgm^{-3}/year] p-value*	*TR (%)*
SMR	**2006 - 2012**	**-0.498 [-1.119,0.150] p>0.05**	**-18.6**	**+0.023 [-0.198,0.256] p>0.05**	**+3.0**	**-0.069 [-0.238,0.096] p>0.05**	**-9.8**
IPR	**2004 - 2014**	**-5.357 [-7.034,-4.024] p<0.001**	**-48.0**	NA	NA	**-1.158 [-1.435,-0.919] p<0.001**	**-47.4**
MPZ	**2007 - 2014**	**+0.803 [-0958,2.254] p>0.05**	**+12.4**	**+0.311 [-0.054,0.699] p>0.05**	**+12.0**	**+0.313 [-0.036,0.706] p>0.05**	**+15.0**
JFJ	**2006- 2014**	**-0.116 [-0.294,-0.027] p<0.05**	**-20.7**	**-0.101 [-0.185,-0.038] p<0.01**	**-30.1**	NA	NA