Electronic supplement to the paper, The sensitivity of aerosol in Europe to two different emission inventories and temporal distribution of emissions, A. de Meij, M. Krol, F. Dentener, E. Vignati, C. Cuvelier, P. Thunis.

Table S1. Density and optical properties of aerosol species.

Species	Density	Refractive index	
	g/cm^3	real	imaginary
Aerosol water [1)]	1.0	1.33	1.75e-7
$(NH_4)_2SO_4$ [2)] (dry)	1.76	1.53	1.0e-8
NH_4NO_3 [2)] (dry)	1.70	1.53	1.0e-8
Organics [3)]	1.50	1.53	5.8e-3
Dust [4)]	2.5	1.515	3.9e-3
Black carbon [5)]	1.50	1.75	4.4e-1
Sea salt [6)] (dry)	2.00	1.49	1.0e-8

1) Downing and Williams 1975.
2) Lowenthal et al., 2000.
3) Provided by S. Kinne (personal communication, 2004)
4) M. Werner, based on Sokolik and Toon, 1999.
5) Hess et al., 1998.
6) Shettle and Fenn, 1979

Table S2. Overview list of species included in the two emission inventories EMEP and AEROCOM.

EMEP emission inventory	AEROCOM emission inventory
PM coarse (emitted as dust)	POM
PM2.5 (emitted as dust, BC, POM, SO_4)	BC
SO_x (given as SO_2)	SO_2
NO_x (given as NO_2)	Mineral dust (2 lognormal distributions)
NH_3	Sea salt (3 lognormal distributions)
NMVOC	SOA (secondary organic aerosol)
CO	NO_x (given as NO)
	NH_3
	NMVOC
	CO

Table S3. Overview CORINAIR source sectors together with the emissions with the largest contribution per sector, given in percentage of the total over all the sectors.

Source category	SO_2	NO_x	NH_3	NMVOC	CO
1. Combustion in energy and transformation industries	52%	20%			
2. Non-industrial combustion plants					18%
3. Combustion in manufacturing industry	13%				10%
4. Production processes					
5. Extraction fossil fuel					
6. Solvents				30%	
7. Road transport		34%		35%	52%
8. Other mobile sources and machinery	12%	30%			
9. Waste treatment and disposal					
10. Agriculture			93%		
11. Nature	11%				

Table S4. Distribution of gas and aerosols in the EMEP emission inventory according to different height levels based on the source sector.

Source category	Height emission gases				Height emission aerosols			
	ground	~150m	~250m	high	ground	~150m	~250m	high
1.Combustion in energy and transformation industries	10%	20%	30%	40%	20%	20%	40%	20%
2. Non-industrial combustion plants	50%	50%			100%			
3. combustion in manufacturing industry	50%	50%			70%	7.5%	15%	7.5%
4. Production processes	90%	10%			100%			
5. Extraction fossil fuel	90%	10%			20%	20%	40%	20%
6. Solvents	100%				100%			
7. Road transport	100%				100%			
8. Other mobile sources and machinery	100%				100%			
9. Waste treatment and disposal	80%	20%			100%			
10. Agriculture	100%				100%			
11. Nature	100%				100%			

Table S5. Distribution of the AEROCOM emissions according to different heights in the model.

Component	Height
Dust	Lowest model layer
Sea salt	Lowest model layer
DMS	Lowest model layer
SOA	Lowest model layer
POM/BC/biofuel	Lowest model layer
POM/BC fossilfuel	Lowest model layer
Biomass burning OC/BC/SO_2	6 levels, 0.0 – 0.1km; 0.1 – 0.5km; 0.5 – 1.0km;1.0 – 2.0km; 2.0 – 3.0km; 3.0 – 6.0km
SO_2/NO_x	Domestic, <100m Road, off-road, <100m Industry, 100 - 300m Shipping, <100m Power-plants, 100 – 300m Volcanic - continuous: 2/3 to 1/1 of volcano top* - explosive: 0.5 to 1.5km above volcano top*

*Height boundaries provided from Halmer et al., 2002.

Table S6. Overview of emissions in EMEP and AEROCOM emission inventory, for June and December and the year 2000 for Europe, spanning from 21° W to 39° E and from 12° S to 66° N. Emissions are given in Tg.

Species (Tg)	AERO June	EMEP June	Ratio June	AERO Dec.	EMEP Dec.	Ratio Dec.	AERO 2000	EMEP 2000	Ratio 2000
NO_x	0.61	0.44	1.39	0.50	0.48	1.03	6.45	5.55	1.16
CO	4.16	3.87	1.07	4.30	4.79	0.90	51.2	53.3	0.96
SO_2	0.93	0.79	1.18	0.96	0.99	0.98	11.4	10.58	1.07
NH_3	0.63	0.38	1.67	0.36	0.30	1.21	6.01	4.40	1.37
SO_4	0.02	0.01	1.31	0.02	0.02	0.92	0.23	0.22	1.03
Sea salt	4.06	4.06	1.00	11.7	11.7	1.00	87.2	87.2	1.00
BC	0.05	0.04	1.02	0.05	0.06	0.71	0.55	0.69	0.81
POM	0.18	0.07	2.48	0.10	0.09	1.05	1.72	1.18	1.45
Dust	0.23	0.36	0.65	0.26	0.43	0.59	3.71	5.58	0.66

Table S7. Overview of the AERONET stations, together with their geographical location, the height of the stations and the number of days for which AOD data is available.

AERONET station	Altitude (m)	Latitude	Longitude	Number of days June 2000	Number of days December 2000
Creteil	57	48.78	2.43	-	4
Lampedusa	45	35.51	12.62	-	-
Lille	60	50.6	3.13	13	7
Bucarest	44	44.45	26.52	-	9
Clermont_Ferrand	1464	45.75	2.95	1	-
El_Arenosillo	0	37.1	-5.26	29*	-
Hamburg	105	53.56	9.96	7	-
Helgoland	33	54.16	7.88	1	-
IMC_Oristano	10	39.9	8.5	27*	14
Modena	56	44.61	10.93	-	-
Palaiseau	156	48.7	2.2	12	-
Toulouse	150	43.55	1.46	-	11
Venice	10	45.3	12.5	30	9
Avignon	32	43.91	4.86	26*	14
Gotland	10	57.91	18.93	2	-
Ispra	235	45.8	8.6	24*	-
Moldova	205	47	28.8	25*	-

* Stations used for analysis

Table S8. Overview of stations used in this work

Code	Station name	Lat.	Lon.	Altitude m	Code	Station name	Lat.	Lon.	Altitude m
AT02	Illmitz	47N	16E	117	GB15	Strath Vaich Dam	57N	4W	270
BE01	Offagne	49N	5E	430	GB16	Glen Dye	56N	2W	85
BE32	Eupen	50N	6E	295	GB36	Harwell	51N	1W	137
BE35	Vezin	50N	4E	160	GB37	Ladybower Res.	53N	1W	420
CH02	Payerne	46N	6E	510	GB38	Lullington Heath	50N	0E	120
CH03	Tänikon	47N	8E	540	GB43	Narberth	51N	4W	160
CH05	Rigi	47N	8E	1030	GB45	Wicken Fen	52N	0W	5
DK03	Tange	56N	9E	13	HU02	K-puszta	46N	19E	125
ES01	San Pablo de los Montes	39N	4W	917	IE03	The Burren	53N	9W	90
ES04	Logroño	42N	2W	445	IE04	Ridge of Capard	53N	7W	340
ES08	Niembro	43N	4W	134	IT01	Montelibretti	42N	12E	48
ES09	Campisabalos	41N	3W	1360	IT04	Ispra	45N	8E	209
ES10	Cabo de Creus	41N	3W	23	LT15	Preila	55N	21E	5
ES11	Barcarrola	38N	6W	393	LV10	Rucava	56N	21E	5
ES12	Zarra	39N	1W	885	LV16	Zoseni	57N	25E	183
ES13	Penausende	41N	5W	985	NL09	Kollumerwaard	53N	6E	1
ES15	Risco Llamo	39N	4W	1241	NL10	Vredepeel	51N	5E	28
FI09	Utö	59N	21E	7	NO01	Birkenes	58N	8E	190
FI17	Virolahti II	60N	27E	4	NO08	Skreådalen	58N	6E	475
FI37	Ahtari II	62N	24E	180	NO39	Kårvatn	62N	8E	210
FR03	La Crouzille	45N	1E	497	NO41	Osen	61N	11E	440
FR05	La Hague	49N	1W	133	PL02	Jarczew	51N	21E	180
FR09	Revin	49N	4E	390	PL04	Leba	54N	17E	2
FR10	Morvan	47N	4E	620	PL05	Diabla Gora	54N	22E	157
FR13	Peyrusse Vieille	43N	0E	236	RU16	Shepeljovo	59N	29E	4
GB02	Eskdalemuir	55N	3W	243	RU18	Danki	54N	37E	150
GB04	Stoke Ferry	52N	0E	15	SE02	Rörvik	57N	11E	10
GB06	Lough Navar	54N	7W	126	SK04	Stará Lesná	49N	20E	808
GB07	Barcombe Mills	50N	0W	8	SK05	Liesek	49N	19E	892
GB13	Yarner Wood	50N	3W	119	TR01	Cubuk II	40N	33E	1169
GB14	High Muffles	54N	0W	267	YU05	Kamenicki vis	43N	21E	813

Table S9a. Monthly mean of SO_2 by S_{EMEP}, S_{AERO} and measurement data, together with the temporal correlation coefficient and the number of measurements for June 2000.

SO_2 ppb Station name	**June** S_{EMEP} mean	r	S_{AERO} mean	r	EMEP data	# measurements
FI37	0.12	0.95	0.27	0.87	0.11	29
GB06	0.23	0.62	0.33	0.66	0.15	28
GB13	0.7	0.84	1.02	0.74	0.39	27
GB16	0.16	0.64	0.39	0.62	0.24	29
IT04	0.55	0.67	2.71	0.69	0.96	17
NL10	2.01	0.89	2.05	0.53	1.09	28
NO01	0.09	0.67	0.52	0.86	0.14	29
NO08	0.17	0.52	0.23	0.64	0.09	29
SE08	0.56	0.76	1.65	0.76	0.40	29
Average	0.51	0.73	1.02	0.71	0.40	

Table S9b. Monthly mean of SO_2 by S_{EMEP}, S_{AERO} and measurement data, together with the temporal correlation coefficient and the number of measurements for December 2000.

SO_2 ppb Station name	**December** S_{EMEP} mean	r	S_{AERO} mean	r	EMEP data	# measurements
AT02	2.46	0.63	2.83	0.69	1.57	30
DK03	0.60	0.56	0.86	0.55	0.23	30
FI17	0.31	0.63	0.55	0.59	0.73	30
FI37	0.23	0.54	0.37	0.75	0.20	30
GB06	0.42	0.90	0.40	0.84	0.24	30
GB13	0.65	0.85	0.86	0.77	0.37	30
GB15	0.41	0.64	0.57	0.64	0.20	30
NL10	2.58	0.65	2.45	0.54	1.58	30
PL02	4.54	0.73	6.92	0.55	2.88	30
PL05	2.34	0.71	3.33	0.59	1.14	29
SE08	0.80	0.74	1.43	0.53	0.48	30
YU05	5.71	0.63	9.02	0.71	7.20	26
Average	1.75	0.68	2.47	0.65	1.40	

Table S10a. Monthly mean of NO_x by S_{EMEP}, S_{AERO} and measurement data, together with the temporal correlation coefficient and the number of measurements for June 2000.

NO_x ppb Station name			**June**			
	S_{EMEP} mean	r	S_{AERO} mean	r	EMEP data	# measurements
AT02	2.68	0.56	5.50	0.58	3.06	28
BE35	11.36	0.56	12.80	0.55	8.09	29
CH03	4.82	0.67	9.63	0.63	5.11	27
GB36	8.94	0.89	14.03	0.90	5.85	29
GB37	4.05	0.66	7.71	0.65	6.81	23
GB38	12.82	0.81	11.59	0.62	5.45	28
GB43	1.26	0.91	1.87	0.86	1.99	19
NL09	3.72	0.89	13.72	0.79	3.41	27
NO01	0.54	0.71	3.68	0.70	0.62	29
PL04	1.51	0.50	7.74	0.60	1.53	29
SE02	2.72	0.66	12.41	0.51	1.84	29
Average	4.95	0.71	9.15	0.67	3.98	

Table S10b. Monthly mean of NO_x by S_{EMEP}, S_{AERO} and measurement data, together with the temporal correlation coefficient and the number of measurements for December 2000.

NO_x ppb Station name			**December**			
	S_{EMEP} mean	r	S_{AERO} mean	r	EMEP data mean	# measurements
AT02	8.27	0.59	8.32	0.72	7.76	30
BE01	7.36	0.61	5.36	0.56	8.28	26
BE32	13.19	0.66	10.03	0.62	7.83	30
BE35	15.27	0.72	12.47	0.71	11.45	30
CH05	11.72	0.56	9.70	0.57	4.53	28
GB37	4.37	0.83	6.34	0.94	8.86	27
GB38	9.11	0.89	8.70	0.61	7.37	25
GB43	2.68	0.84	2.79	0.80	5.75	29
GB45	12.81	0.69	17.28	0.60	11.71	30
IT01	7.46	0.72	8.76	0.67	5.87	30
LT15	2.52	0.75	4.29	0.64	5.16	30
NL09	7.95	0.82	10.62	0.72	9.61	30
NO08	1.04	0.76	1.53	0.58	0.83	30
NO41	0.82	0.84	1.71	0.63	1.10	30
PL05	3.40	0.62	6.33	0.63	3.59	29
SE08	2.33	0.88	4.25	0.78	2.73	30
SK05	5.44	0.64	2.49	0.61	5.32	30
Average	6.81	0.73	7.12	0.67	6.34	

Table S11a. Monthly mean of $SO_4^=$ by S_{EMEP}, S_{AERO} and measurement data, together with the temporal correlation coefficient and the number of measurements for June 2000.

SO_4 ppb Station name			**JUNE**			
	S_{EMEP} mean	r	S_{AERO} mean	r	EMEP data mean	# measurements
AT02	1.38	0.66	1.67	0.61	0.91	29
CH05	1.03	0.62	1.17	0.60	0.74	27
ES04	1.02	0.78	0.90	0.72	1.33	25
ES08	0.70	0.88	0.76	0.82	1.85	28
ES11	0.77	0.65	0.79	0.60	0.97	29
FI09	0.29	0.76	0.60	0.62	0.39	29
FI17	0.33	0.84	0.46	0.78	0.43	29
FI37	0.25	0.84	0.30	0.81	0.30	24
FR05	0.67	0.66	0.75	0.75	0.87	25
FR09	0.73	0.76	0.70	0.74	0.86	25
FR10	0.71	0.67	0.71	0.69	0.57	29
FR13	0.77	0.74	0.66	0.75	0.71	29
GB02	0.34	0.83	0.39	0.81	0.45	29
GB04	0.62	0.69	0.67	0.69	0.83	29
GB06	0.34	0.89	0.41	0.89	0.42	28
GB07	0.76	0.76	0.91	0.77	0.81	29
GB13	0.54	0.94	0.62	0.91	0.61	27
GB14	0.46	0.91	0.58	0.90	0.62	28
GB15	0.16	0.61	0.18	0.62	0.23	29
GB16	0.23	0.74	0.26	0.74	0.35	29
HU02	1.36	0.69	1.94	0.73	1.05	27
IE03	0.39	0.89	0.57	0.81	0.36	25
IE04	0.41	0.80	0.44	0.77	0.27	29
LT15	0.42	0.83	0.57	0.89	0.48	29
NL09	0.50	0.84	0.57	0.84	0.51	25
NL10	0.79	0.56	0.71	0.66	0.55	26
NO01	0.29	0.92	0.37	0.93	0.51	29
NO08	0.29	0.81	0.30	0.92	0.43	29
NO39	0.11	0.70	0.09	0.68	0.15	29
NO41	0.22	0.88	0.24	0.90	0.28	28
PL02	0.98	0.57	1.53	0.55	1.29	29
PL04	0.50	0.76	0.73	0.77	0.81	29
PL05	0.54	0.58	0.77	0.61	0.42	29
RU16	0.32	0.80	0.52	0.71	0.12	23
RU18	0.75	0.62	0.70	0.58	0.26	29
SE02	0.40	0.64	0.57	0.68	0.91	28
SK04	1.46	0.74	1.67	0.79	0.74	29
SK05	1.43	0.80	1.63	0.80	0.72	29
TR01	1.08	0.56	1.30	0.55	0.50	26
Average	0.62	0.75	0.74	0.74	0.63	

Table S11b. Monthly mean of $SO_4^{=}$ by S_{EMEP}, S_{AERO} and measurement data, together with the temporal correlation coefficient and the number of measurements for December 2000.

SO_4 ppb Station name			**DECEMBER**			
	S_{EMEP} mean	r	S_{AERO} mean	r	EMEP data	# measurements
CH02	0.66	0.68	0.75	0.60	0.42	30
ES04	0.23	0.61	0.27	0.61	0.39	27
ES09	0.17	0.59	0.17	0.56	0.26	30
ES12	0.20	0.54	0.20	0.62	0.29	29
ES13	0.18	0.78	0.17	0.76	0.22	27
ES15	0.17	0.53	0.15	0.56	0.28	19
FR03	0.21	0.60	0.17	0.63	0.21	18
FR05	0.18	0.55	0.16	0.58	0.47	30
FR09	0.41	0.60	0.33	0.78	0.43	27
FR10	0.19	0.59	0.15	0.54	0.24	30
FR13	0.32	0.59	0.26	0.52	0.20	30
GB07	0.14	0.88	0.42	0.65	0.44	23
GB13	0.15	0.90	0.14	0.86	0.37	29
GB14	0.13	0.78	0.17	0.85	0.43	25
GB15	0.05	0.69	0.07	0.81	0.11	30
HU02	0.71	0.69	1.00	0.61	1.45	30
IT01	0.66	0.54	0.76	0.58	0.58	30
LT15	0.21	0.63	0.20	0.52	0.93	30
NL10	0.70	0.70	0.55	0.80	0.53	30
NO08	0.07	0.57	0.05	0.81	0.18	30
PL02	0.62	0.71	0.60	0.71	1.44	30
PL04	0.26	0.59	0.38	0.53	1.72	30
PL05	0.31	0.55	0.32	0.53	1.06	29
Average	0.30	0.65	0.32	0.65	0.55	

Table S12. Monthly mean of NO_3^- by S_{EMEP}, S_{AERO} and measurement data, together with the temporal correlation coefficient and the number of measurements for December 2000.

NO_3^- ppb Station name			**December**			
	S_{EMEP} mean	r	S_{AERO} mean	r	EMEP data	# measurements
IT01	1.46	0.51	1.98	0.60	1.48	30
NL09	1.69	0.68	2.07	0.70	1.05	27
NL10	2.11	0.89	2.30	0.87	1.23	30
PL02	2.70	0.91	2.59	0.91	1.71	30
PL04	1.68	0.72	2.24	0.65	1.41	28
RU18	0.41	0.58	1.13	0.60	0.40	28
Average	1.68	0.72	2.05	0.72	1.21	

Table S13a. Monthly mean of NH_3 + NH_4^+ (total ammonium) by S_{EMEP}, S_{AERO} and measurement data, together with the temporal correlation coefficient and the number of measurements for June 2000.

NH_3+NH_4^+ ppb			**JUNE**			
Station name	S_{EMEP} mean	r	S_{AERO} mean	r	EMEP data	# measurements
AT02	5.79	0.78	10.81	0.77	4.20	29
CH05	8.73	0.58	12.37	0.55	4.99	27
DK03	1.90	0.59	9.67	0.67	3.01	14
ES01	2.51	0.63	4.82	0.56	2.47	17
ES09	1.75	0.60	2.75	0.56	0.49	29
ES11	3.48	0.54	6.28	0.53	2.89	29
ES12	2.46	0.81	2.74	0.70	4.59	29
FI09	0.55	0.65	0.86	0.69	0.81	29
FI37	0.73	0.91	0.84	0.92	0.62	29
GB02	1.90	0.54	5.29	0.59	1.36	29
HU02	5.71	0.77	12.19	0.81	5.71	27
LT15	1.10	0.82	1.64	0.80	1.80	28
LV10	0.82	0.79	1.47	0.81	1.76	29
LV16	0.95	0.60	1.23	0.57	1.14	29
NO01	0.57	0.95	0.96	0.93	0.79	29
NO08	0.64	0.69	0.74	0.63	2.52	29
NO41	0.45	0.87	0.45	0.86	0.56	28
PL02	4.47	0.83	9.63	0.77	3.09	29
PL04	1.24	0.85	5.15	0.76	2.58	29
SE02	1.00	0.67	2.17	0.72	1.91	28
Average	2.34	0.72	4.16	0.71	2.36	

Table S13b. Monthly mean of NH_3 + NH_4^+ (total ammonium) by S_{EMEP}, S_{AERO} and measurement data, together with the temporal correlation coefficient and the number of measurements for December 2000.

NH_3+NH_4^+ ppb			**December**			
Station name	S_{EMEP} mean	r	S_{AERO} mean	r	EMEP data	# measurements
DK03	3.32	0.59	5.28	0.65	3.51	30
ES04	1.52	0.55	3.14	0.59	4.55	30
ES10	2.93	0.65	2.00	0.50	2.46	26
ES12	0.94	0.73	1.10	0.51	1.76	29
ES13	1.12	0.57	1.75	0.57	0.70	30
FI09	0.48	0.70	0.57	0.71	0.80	30
HU02	6.37	0.70	8.68	0.65	5.63	30
LT15	1.56	0.62	1.53	0.65	4.96	30
LV10	1.07	0.66	1.08	0.68	2.07	30
PL02	4.95	0.86	5.50	0.81	6.75	30
PL05	3.00	0.73	2.85	0.78	2.52	29
SE02	1.26	0.74	1.53	0.69	1.35	30
Average	2.38	0.68	2.92	0.65	3.09	

Table S14a. Monthly mean BC concentrations calculated by S_{EMEP} and S_{AERO}, together with EMEP measurement data for December 2002 and June 2003.

Station name	Dec 2002 mean [1)] EMEP BC measurements mean μg/m3	S_{EMEP} 2000 Dec BC μg/m3 monthly mean	S_{AERO} 2000 Dec BC μg/m3 monthly mean	June 2003 mean[1)] EMEP BC measurements mean μg/m3	S_{EMEP} 2000 June BC μg/m3 monthly mean	S_{AERO} 2000 June BC μg/m3 monthly mean
AT02	1.00	0.84	0.71	0.72	0.57	0.77
CZ03	1.50	0.76	0.68	1.20	0.39	0.66
DE02	1.24	0.51	0.68	0.33	0.33	0.56
FI17	0.42	0.21	0.11	0.20	0.17	0.19
IT04	3.74	1.42	2.17	1.05	0.62	1.37
NL09	1.33	0.32	0.47	0.41	0.21	0.47
PT01	0.78	0.14	0.10	1.10	0.20	0.16
SE12	0.29	0.14	0.13	0.15	0.15	0.16
SK04	0.92	0.32	0.14	0.62	0.23	0.27
Average	1.25	0.47	0.51	0.64	0.30	0.47

Table S15. Monthly mean POM concentrations calculated by S_{EMEP} and S_{AERO}, together with EMEP measurement data for December 2002 and June 2003.

Station name	Dec 2002 mean [1)] EMEP POM measurements mean μg/m3	S_{EMEP} 2000 Dec POM μg/m3 monthly mean	S_{AERO} 2000 Dec POM μg/m3 monthly mean	June 2003 mean[1)] EMEP POM measurements mean μg/m3	S_{EMEP} 2000 June POM μg/m3 monthly mean	S_{AERO} 2000 June POM μg/m3 monthly mean
AT02	5.99	1.24	2.28	4.44	1.05	3.78
CZ03	6.53	1.28	1.70	5.46	0.78	2.38
DE02	7.94	0.77	0.84	3.61	1.52	1.91
FI17	1.70	0.29	0.32	1.84	0.25	1.47
IT04	16.01	1.44	1.44	4.37	0.70	2.35
NL09	4.84	0.49	0.58	2.04	0.34	0.67
PT01	4.39	0.19	0.17	4.23	0.32	0.78
SE12	1.20	0.20	0.30	2.30	0.22	0.72
SK04	3.04	0.47	0.30	3.72	0.39	0.96
Average	5.74	0.71	0.88	4.85	0.62	1.67

[1)] Based on a few days of data available, which can differ for each station. Data from http://www.nilu.no/projects/ccc/emepdata.html

Table S16. Monthly mean AOD calculated by TM5 with the EMEP emission inventory and the AEROCOM emission inventory, together with the monthly mean AOD of the AERONET stations, June 2000. The number of observations by AERONET for the month June are given, together with the corresponding correlation coefficients.

Name station	Monthly mean + sdev AOD S_{EMEP}	r.	Monthly mean + sdev AOD S_{AERO}	r.	Monthly mean + sdev AOD AERONET	# Obser-vations
Moldova	0.18 ± 0.17	0.27	0.18 ± 0.15	0.25	0.18 ± 0.11	958
El-Arenosillo	0.09 ± 0.11	0.52	0.09 ± 0.10	0.52	0.12 ± 0.07	1165
Ispra	0.19 ± 0.31	0.35	0.22 ± 0.27	0.41	0.34 ± 0.28	539
IMC_ Oristano	0.15 ± 0.08	0.17	0.14 ± 0.07	0.18	0.15 ± 0.08	1115
Avignon	0.11 ± 0.12	0.37	0.11 ± 0.11	0.33	0.15 ± 0.07	1058
Hamburg	0.12 ± 0.10	0.17	0.16 ± 0.12	0.05	0.19 ± 0.09	167
Lille	0.11 ± 0.11	0.03	0.12 ± 0.10	0.01	0.19 ± 0.08	261
Palaiseau	0.15 ± 0.11	-0.04	0.15 ± 0.09	0.07	0.14 ± 0.10	151
Venice	0.25 ± 0.29	0.16	0.24 ± 0.27	0.15	0.26 ± 0.14	1056
Average	0.15 ± 0.16	0.22	0.16 ± 0.14	0.22	0.19 ± 0.11	

Table S17. Monthly mean AOD by TM5 with the EMEP emission inventory and the AEROCOM emission inventory, together with the monthly mean AOD of the AERONET stations, December 2000. The number of observations by AERONET for the month December are given, together with the corresponding correlation coefficients.

Name Station	Monthly mean + sdev AOD S_{EMEP}	r.	Monthly mean + sdev AOD S_{AERO}	r.	Monthly mean +sdev AOD AERONET	# Obser-vations
Lille	0.14± 0.08	-0.33	0.12 ± 0.07	-0.33	0.13 ± 0.05	66
Bucarest	0.08 ± 0.05	-0.38	0.08 ± 0.05	-0.33	0.10 ± 0.06	113
IMC_ Oristano	0.08 ± 0.05	-0.18	0.08 ± 0.04	-0.18	0.10 ± 0.07	160
Toulouse	0.06 ± 0.03	0.34	0.06 ± 0.03	0.28	0.13 ± 0.05	103
Venice	0.07 ± 0.10	0.45	0.05 ± 0.07	0.32	0.14 ± 0.10	112
Avignon	0.07 ± 0.04	0.38	0.06 ± 0.03	0.34	0.09 ± 0.04	141
Average	0.08 ± 0.06	0.05	0.07 ± 0.05	0.02	0.12 ± 0.06	

Table S18a and S18b. The monthly mean concentrations and corresponding standard deviation of aerosol precursor gases NH_3 and NO_x at 14 EMEP stations for which the correlation coefficient for calculated NO_x between S_{EMEP} and S_{EMEP_c} in June is < 0.8, is presented. This allows us to select those stations for which the daily and weekly distribution of NO_x emissions is large. For the comparison of NH_3 and the analysis for December we took the same stations.

(a)

June	**NH_3**			**NO_x**			
Station name	S_{EMEP} ppb +sdev	S_{EMEP_C} ppb +sdev	r	S_{EMEP} ppb+sdev	S_{EMEP_C} ppb+sdev	r	EMEP data
AT02	3.03 ± 1.25	3.24 ± 1.62	0.76	2.68 ± 0.53	2.95 ± 0.64	0.46	3.06 ± 0.83
BE32	6.32 ± 3.79	7.27 ± 5.04	0.79	8.23 ± 2.52	9.32 ± 3.42	0.66	6.81 ± 3.03
BE35	5.43 ± 2.97	5.95 ± 3.60	0.72	11.36 ± 3.68	12.39 ± 4.53	0.65	8.09 ± 2.27
CH02	4.61 ± 2.14	4.86 ± 2.50	0.78	2.14 ± 0.46	2.33 ± 0.53	0.52	5.51 ± 1.98
CH03	4.70 ± 2.63	4.95 ± 2.84	0.83	4.82 ± 1.29	5.16 ± 1.37	0.46	5.11 ± 1.46
CH05	5.37 ± 2.72	5.63 ± 3.01	0.78	4.44 ± 1.12	4.75 ± 1.24	0.48	4.76 ± 1.34
GB45	2.33 ± 1.27	2.43 ± 1.16	0.65	10.28 ± 6.01	10.90 ± 5.62	0.68	4.62 ± 1.84
HU02	2.97 ± 1.24	3.15 ± 1.40	0.77	2.71 ± 0.53	2.95 ± 0.64	0.37	1.92 ± 0.97
IT01	2.14 ± 1.08	2.30 ± 1.26	0.78	4.83 ± 1.00	5.35 ± 1.06	0.57	5.34 ± 1.28
IT04	6.41 ± 2.44	6.81 ± 2.81	0.67	3.61 ± 0.42	3.84 ±0.54	0.29	7.07 ± 2.22
NL10	6.87 ± 4.17	7.53 ± 4.94	0.76	11.52 ± 3.85	12.41 ± 4.39	0.69	8.89 ± 2.86
PL02	2.51 ± 1.27	2.70 ± 1.68	0.87	1.57 ± 0.35	1.68 ±0.40	0.63	4.48 ± 1.50
PL05	1.26 ± 0.83	1.33 ± 0.97	0.89	0.65 ± 0.10	0.69 ±0.26	0.59	0.59 ± 0.18
TR01	0.04 ± 0.06	0.05 ± 0.09	0.88	0.29 ± 0.10	0.31 ± 0.15	0.74	0.79 ± 0.49
Average	3.84± 2.07	3.99 ± 2.26	0.78	4.85 ± 1.68	5.11 ± 1.72	0.56	4.71 ± 1.70

(b)

Dec.	NH_3			NO_x			
Station name	S_{EMEP} ppb +sdev	S_{EMEP_C} ppb +sdev	r	S_{EMEP} ppb +sdev	S_{EMEP_C} ppb +sdev	r	EMEP data
AT02	0.87 ± 0.56	0.92 ± 0.59	0.80	8.47 ±3.91	8.67 ± 3.92	0.94	7.76 ± 3.25
BE32	3.60 ± 3.01	3.70 ± 3.03	0.85	12.94 ±11.49	13.18 ± 11.28	0.96	7.83 ± 5.81
BE35	3.28 ± 2.69	3.35 ± 2.63	0.85	14.97 ±13.16	15.17 ± 12.96	0.96	11.45 ± 5.35
CH02	3.41 ± 2.24	3.50 ± 2.10	0.86	5.83 ± 3.43	5.88 ± 3.30	0.95	11.30 ±4.63
CH03	3.15 ± 2.20	3.21 ± 2.01	0.87	10.69 ± 6.57	10.77 ± 6.23	0.94	11.25 ± 3.90
CH05	4.64 ± 2.84	4.82 ± 2.74	0.86	11.21 ± 6.31	11.29 ± 6.02	0.94	4.53 ± 3.53
GB45	0.97 ± 0.83	0.98 ± 0.73	0.85	12.60 ± 11.58	12.97 ± 12.00	0.94	11.71 ± 7.30
HU02	1.61 ± 0.95	1.73 ±1.10	0.84	6.97 ± 2.91	7.18 ± 2.94	0.89	4.63 ± 1.50
IT01	1.16 ± 0.83	1.15 ± 0.60	0.84	7.67 ± 3.95	7.75 ± 3.74	0.87	5.87 ± 1.72
IT04	6.39 ± 3.00	6.70 ± 3.13	0.81	16.00 ±7.17	15.97 ± 6.98	0.96	18.53 ± 6.92
NL10	4.66 ± 4.15	4.83 ± 4.47	0.89	18.33 ± 15.77	18.71 ± 16.22	0.96	13.98 ± 5.80
PL02	1.05 ± 0.88	1.07 ± 0.94	0.88	6.31 ± 3.64	6.40 ± 3.68	0.97	8.33 ± 3.33
PL05	0.38 ± 0.28	0.39 ± 0.24	0.80	3.36 ±1.87	3.36 ±1.84	0.98	3.59 ±1.86
TR01	0.12 ± 0.13	0.13 ± 0.13	0.94	1.57 ± 1.01	1.62 ± 1.03	0.96	3.64 ± 3.23
Average	2.60 ± 1.85	2.54 ± 1.70	0.85	9.37 ± 6.40	9.36 ± 6.22	0.94	8.53 ± 4.09

Table S19. Monthly mean and standard deviation for nitrate aerosol for the simulation with the daily and weekly temporal distribution (S_{EMEP}) of emissions and without the daily and weekly temporal distribution (S_{EMEP_C}), together with the EMEP measurement data, for December (a) and June (b) 2000.

(a)

December NO_3 aerosol					
Station name	Monthly mean S_{EMEP} ppb + sdev	r	Monthly mean S_{EMEP_C} ppb + sdev	r	EMEP measurements ppb + sdev
HU02	3.40 ± 2.02	0.56	3.41 ± 1.98	0.57	1.64 ± 1.02
IT01	1.46 ± 1.43	0.51	1.52 ± 1.44	0.52	1.48 ± 0.93
IT04	5.62 ± 1.05	0.29	5.60 ± 1.05	0.22	2.47 ± 2.19
LV10	0.61 ± 0.66	0.03	0.61 ± 0.66	0.03	0.50 ± 0.27
LV16	0.40 ± 0.32	0.33	0.42 ± 0.33	0.33	0.33 ± 0.21
NL09	1.69 ± 1.65	0.68	1.75 ± 1.66	0.69	1.05 ± 0.67
NL10	2.11 ± 1.74	0.89	2.15 ± 1.70	0.88	1.23 ± 0.78
NO08	0.19 ± 0.30	0.45	0.19 ± 0.30	0.44	0.20 ± 0.22
PL02	2.70 ± 2.14	0.91	2.73 ± 2.11	0.91	1.71 ± 1.24
PL03	0.11 ± 0.14	0.30	0.12 ± 0.14	0.34	0.21 ± 0.18
PL04	1.68 ± 1.30	0.72	1.69 ± 1.32	0.71	1.49 ± 0.86
RU16	0.19 ± 0.25	0.23	0.18 ± 0.25	0.23	0.71 ± 0.41
RU18	0.41 ± 0.62	0.58	0.42 ± 0.63	0.60	0.42 ± 0.27
SK02	0.05 ± 0.09	0.02	0.05 ± 0.09	0.02	0.13 ± 0.11
SK04	0.98 ± 0.57	0.35	0.98 ± 0.57	0.28	0.41 ± 0.23
SK05	0.75 ± 0.52	0.34	0.75 ± 0.54	0.34	0.88 ± 0.40
Average	1.40 ± 0.93	0.45	1.41 ± 0.92	0.44	0.93 ± 0.62

(b)

June NO_3 aerosol		
Station name	Monthly mean S_{EMEP} ppb + sdev	Monthly mean S_{EMEP_C} ppb + sdev
HU02	< 0.01	< 0.01
IT01	0.27 ± 0.36	0.39 ± 0.50
IT04	1.27 ± 1.00	1.49 ± 1.05
LV10	< 0.01	< 0.01
LV16	< 0.01	< 0.01
NL09	0.31 ± 0.61	0.39 ± 0.80
NL10	1.18 ± 1.42	1.24 ± 1.44
NO08	< 0.01	0.01 ± 0.02
PL02	< 0.01	0.01 ± 0.01
PL03	0.09 ± 0.12	0.08 ± 0.11
PL04	0.01 ± 0.02	0.01 ± 0.02
RU16	< 0.01	< 0.01
RU18	< 0.01	< 0.01
SK02	0.05 ± 0.10	0.04 ± 0.09
SK04	0.09 ± 0.16	0.09 ± 0.15
SK05	0.09 ± 0.15	0.08 ± 0.14

Table S20. Monthly mean and standard deviation for the simulation with seasonal temporal distribution (S_{EMEP_C}) and without seasonal temporal distribution ($S_{EMEP\_C\_annual}$) for $SO_4^=$ (a) and BC (b), for June 2000. For BC we compare measurement data of June 2003 since BC data were not available for 2000.

(a)

Station name	$SO_4^=$ S_{EMEP_c} ppb + sdev	$SO_4^=$ $S_{EMEP\_C\_annual}$ ppb + sdev	EMEP measurements ppb + sdev
AT02	1.39 ± 1.24	1.67 ± 1.42	0.92 ± 0.43
CH02	0.94 ± 0.87	1.07 ± 0.90	0.66 ± 0.26
CH05	1.04 ± 0.97	1.16 ± 1.00	0.74 ± 0.33
ES10	0.99 ± 0.57	1.06 ± 0.55	1.41 ± 0.78
ES11	0.77 ± 0.46	0.77 ± 0.46	0.97 ± 0.55
ES12	1.03 ± 0.54	1.05 ± 0.54	1.31 ± 0.63
FI09	0.30 ± 0.25	0.32 ± 0.27	0.39 ± 0.27
FI17	0.33 ± 0.29	0.37 ± 0.33	0.43 ± 0.34
FI37	0.25 ± 0.22	0.27 ± 0.26	0.30 ± 0.25
FR05	0.67 ± 0.41	0.71 ± 0.44	0.87 ± 0.58
FR09	0.73 ± 0.42	0.80 ± 0.46	0.86 ± 0.38
FR10	0.71 ± 0.55	0.80 ± 0.56	0.57 ± 0.24
FR13	0.77 ± 0.54	0.82 ± 0.54	0.71 ± 0.38
FR14	0.86 ± 0.74	0.98 ± 0.77	0.62 ± 0.17
GB02	0.35 ± 0.32	0.37 ± 0.36	0.45 ± 0.29
GB04	0.63 ± 0.35	0.66 ± 0.37	0.83 ± 0.50
GB06	0.35 ± 0.41	0.36 ± 0.43	0.42 ± 0.43
GB13	0.54 ± 0.35	0.58 ± 0.39	0.61 ± 0.55
GB14	0.46 ± 0.38	0.49 ± 0.42	0.62 ± 0.46
GB15	0.16 ± 0.19	0.17 ± 0.20	0.23 ± 0.14
GB16	0.23 ± 0.27	0.24 ± 0.30	0.35 ± 0.26
HU02	1.36 ± 0.79	1.70 ± 0.93	1.05 ± 0.39
IE03	0.40 ± 0.44	0.42 ± 0.74	0.36 ± 0.34
IE04	0.41 ± 0.42	0.44 ± 0.46	0.27 ± 0.25
LT15	0.43 ± 0.40	0.49 ± 0.45	0.48 ± 0.26
LV16	0.31 ± 0.28	0.36 ± 0.32	0.16 ± 0.23
NL09	0.50 ± 0.41	0.53 ± 0.46	0.51 ± 0.33
NL10	0.80 ± 0.42	0.86 ± 0.46	0.55 ± 0.31
NO01	0.30 ± 0.41	0.32 ± 0.44	0.51 ± 0.60
NO08	0.30 ± 0.43	0.32 ± 0.46	0.43 ± 0.54
NO39	0.11 ± 0.10	0.11 ± 0.11	0.15 ± 0.09
NO41	0.22 ± 0.36	0.24 ± 0.40	0.28 ± 0.37
PL02	0.99 ± 0.76	1.27 ± 0.97	1.26 ± 0.40
PL04	0.50 ± 0.52	0.56 ± 0.60	0.81 ± 0.43
PL05	0.54 ± 0.42	0.64 ± 0.50	0.42 ± 0.35
RU16	0.32 ± 0.28	0.36 ± 0.33	0.12 ± 0.07
RU18	0.75 ± 0.31	0.88 ± 0.38	0.26 ± 0.13
SE02	0.40 ± 0.44	0.43 ± 0.49	0.91 ± 1.47
SK04	1.45 ± 1.00	1.76 ± 1.18	0.74 ± 0.38
SK05	1.42 ± 1.05	1.71 ± 1.23	0.72 ± 0.36
TR01	1.07 ± 1.06	1.24 ± 1.21	0.50 ± 0.39
Average	0.64 ± 0.50	0.72 ± 0.56	0.60 ± 0.39

(b)

Station name	BC S_{EMEP_c} μg/m3	BC $S_{EMEP\_C\_annual}$ μg/m3	EMEP measurements June 2003 μg/m3
AT02	0.58 ± 0.32	0.77 ± 0.42	0.72
CZ03	0.41 ± 0.24	0.62 ± 0.38	1.20
DE02	0.34 ± 0.25	0.37 ± 0.28	0.33
FI17	0.17 ± 0.11	0.21 ± 0.15	0.20
IT04	0.48 ± 0.23	0.62 ± 0.30	1.05
NL09	0.22 ± 0.35	0.25 ±0.41	0.41
PT01	0.21 ± 0.10	0.25 ±0.12	1.10
SE12	0.15 ± 0.13	0.17 ± 0.15	0.15
SK04	0.23 ± 0.10	0.37 ± 0.17	0.62
Average	0.31 ± 0.20	0.40 ± 0.26	0.64

(c)

Station name	POM S_{EMEP_c} μg/m3	POM $S_{EMEP\_C\_annual}$ μg/m3	OC EMEP measurements June 2003 μg/m3
AT02	1.06 ± 0.56	1.32 ± 0.69	4.44
CZ03	0.79 ± 0.83	1.10 ± 0.99	5.46
DE02	1.53 ± 1.19	1.58 ± 1.22	3.61
FI17	0.26 ± 0.17	0.32 ± 0.22	1.84
IT04	0.71 ± 0.33	0.90 ± 0.42	16.01
NL09	0.35 ± 0.58	0.39 ± 0.66	2.04
PT01	0.33 ± 0.16	0.40 ± 0.19	4.23
SE12	0.23 ± 0.20	0.25 ± 0.23	2.30
SK04	0.39 ± 0.18	0.59 ± 0.28	3.72
Average	0.63 ± 0.47	0.76 ± 0.54	4.85

Table 21. Monthly mean AOD values for S_{EMEP_C} and $S_{EMEP\_C\_annual}$ together with the monthly mean AERONET AOD values, for June 2000.

Name station	Monthly mean + sdev AOD S_{EMEP_C}	r.	Monthly mean + sdev AOD $S_{EMEP\_C\_annual}$	r.	Monthly mean + sdev AOD AERONET
Moldova	0.18 ± 0.16	0.27	0.20 ± 0.18	0.29	0.18 ± 0.11
El-Arenosillo	0.09 ± 0.10	0.52	0.09 ± 0.10	0.51	0.12 ± 0.07
Ispra	0.20 ± 0.30	0.34	0.21 ± 0.31	0.34	0.34 ± 0.28
IMC_ Oristano	0.15 ± 0.08	0.17	0.15 ± 0.08	0.16	0.15 ± 0.08
Avignon	0.10 ± 0.12	0.36	0.11 ± 0.12	0.35	0.15 ± 0.07
Hamburg	0.12 ± 0.10	0.14	0.13 ± 0.10	0.16	0.19 ± 0.09
Lille	0.11 ± 0.10	0.02	0.12 ± 0.11	0.02	0.19 ± 0.08
Palaiseau	0.15 ± 0.10	0.03	0.16 ± 0.11	0.01	0.14 ± 0.10
Venice	0.25 ± 0.28	0.16	0.26 ± 0.29	0.29	0.26 ± 0.14
Average	0.15 ± 0.15	0.22	0.16 ± 0.16	0.23	0.19 ± 0.11