Supplement of:

Effects of ship emissions on air quality in the Baltic Sea region simulated with three different chemistry transport models

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Table S1: Overview of rural background stations included in this study.

Station Code	Station name	Longitude	Latitude	Alt. [m]	NO_2	SO_2	$PM_{2.5}$	O_3
DENI063	Altes Land	9.68503	53.52418	3	X			X
DESH001	Altendeich	9.58587	53.67055	8				X
DESH008	Bornhöved	10.24060	54.09323	45	X		X	X
DESH013	Fehmarn	11.21599	54.41299	2				X
DEMV004	Gülzow	12.06471	53.81777	17	X	X		X
DEMV012	Löcknitz	14.25741	53.52046	17	X	X		X
DK0054A	Keldsnor/9054	10.73639	54.74639	3	X			X
SE0012R	Aspvreten	17.38196	58.80111	25			X	X
SE0005R	Bredkålen	15.33558	63.84889	380				X
SE0039R	Grimsö	15.46891	59.72722	132				X
SE0066A	Norr Malma	18.63112	59.83250	20	X		X	X
SE0032R	Norra-Kvill	15.56474	57.81083	263				X
SE0001A	Rådhuset	13.00196	55.60639	25	X	X	X	X
SE0014R	Råö	11.91418	57.39361	10				X
SE0011R	Vavihill	13.14946	56.02806	163			X	X
SE0035R	Vindeln	19.76723	64.24972	271				X
FI00372	Ähtäri 2	24.19195	62.58861	180	X			X
FI00453	Jokioinen	23.49668	60.81694	104				X
FI00208	Luukki	24.68945	60.31361	64	X	X	X	X
FI00349	Utö	21.37389	59.77917	7	X	X	X	X
FI00351	Virolahti	27.67139	60.52611	4	X	X	X	X
LT00051	Aukstaitija	26.00417	55.46333	180				X
LT00052	Dzukija N.	24.28973	54.09250	140				X
LT00054	Preila	21.03085	55.37639	5				X
LT00053	Zemaitija	21.88695	56.00834	155				X
LV00010	Rucava	21.17333	56.16235	18				X
LV00016	Zoseni	25.90562	57.13485	183				X
EE0009R	Lahemaa	25.93057	59.49445	32	X	X		X
EE0016A	Saarejärve	26.75890	58.70278	50	X	X		X
EE0011R	Vilsandi	21.84501	58.37611	6	X	X		X
PL0066A	Kp Ciecho Tezniowa	18.78194	53.87167	44	X			X
PL0077A	Kp Ziel Bory Tuch	17.93333	53.65000	40	X	X		X
PL0561A	Gdansk, AM17	18.18130	54.10228	186	X	X		X
PL0004R	Leba	17.53445	54.75417	4				X
PL0005R	Diabla Gora	22.03806	54.12528	157				X

Table S2: Overview of urban and suburban background stations in this study.

Station Code	Station name	Longitude	Latitude	Alt. [m]	NO_2	SO_2	$PM_{2.5}$	O_3
DESH016	Barsbüttel	10.21487	53.57058	42				X
DEMV019	Güstrow	12.17551	53.78175	17	X		X	X
DEHH079	Hamburg Altona Elb.	9.94482	53.54527	25	X	X		
DEHH074	Hamburg Billstedt	10.10282	53.53853	18	X			
DEHH049	Hamburg Blankenese	9.78623	53.56812	75	X			X
DEHH047	Hamburg Bramfeld	10.11060	53.63074	31	X			X
DEHH033	Hamburg Flughafen N.	9.99801	53.63829	13	X			X
DEHH008	Hamburg Sternschanze	9.96788	53.56414	15	X	X	X	X
DEHH059	Hamburg	9.99057	53.50793	3	X	X	X	
DESH015	Itzehoe	9.53264	53.92471	40				X
DESH033	Kiel, Max-Planck-Str.	10.11656	54.30967	29	X			X
DESH023	Lübeck, St. Jürgen	10.69594	53.83549	12	X	X	X	X
DEMV007	Rostock, Stuthof	12.17411	54.16156	5	X	X		X
DEMV021	Rostock, Warnemünde	12.08000	54.17133	2	X	X	X	X
DESH006	Schleswig	9.54938	54.52730	42				X
DK0053A	Aalborg/8158	9.93085	57.04667	30	X			X
DK0052A	Aarhus/6159	10.19724	56.15111	20	X			X
DK0045A	Copenhagen/1259	12.56140	55.70028	25	X			X
DK0046A	Odense/9159	10.38917	55.39639	25	X			X
SE0004A	Göteborg, Femman	11.97000	57.70861	30	X	X		X
SE0053A	Helsingborg Norr	12.69084	56.04750	10	X			X
SE0054A	Lund	13.20084	55.70083	20	X	X		X
SE0022A	Södermalm	18.05751	59.31694	20	X		X	X
SE0030A	Umeå, Stadsbiblioteket	20.26585	63.82694	20	X			
FI00363	Kasarmipuisto	27.67000	62.89361	112	X		X	X
FI00761	Nahkurintori 2	24.06287	60.25145	56			X	
FI00431	Palokka 2	25.70918	62.29000	143	X			
FI00301	Pyykösjärvi	25.49779	65.04334	8				X
FI00867	Satulakatu	25.59109	60.97907	150				X
FI00586	Vaasa Vesitorini	21.60407	63.10121	16			X	X
FI00781	Vartiokylä Huivipolku	25.10250	60.22389	25	X		X	X
LT00044	Kaunas - Noreikiskes	23.83584	54.88361	73	X	X	X	X
LT00021	N. Akmene	22.87084	56.31944	75		X		
LT00012	Panevezys - Centras	24.36557	55.72500	52	X			X

Table S2. Continued.

Station Code	Station name	Longitude	Latitude	Alt. [m]	NO_2	SO_2	$PM_{2.5}$	O_3
LT00002	Vilnius - Lazdynai	25.21084	54.68611	170	X	X		X
LT00001	Vilnius - Senamiestis	25.28519	54.67763	116	X	X		X
LV0RKE2	Riga Kengarags-2	24.15651	56.93593	7	X	X		X
LV00RP5	Riga Park	24.11587	56.95061	8	X	X		X
LV00VN1	Ventspils	21.59199	57.40463	1	X	X		X
EE0022A	Narva	28.17917	59.37616	25	X	X		X
EE0018A	Oismäe	24.64946	59.41417	6	X	X		X
EE0021A	Tartu	26.73472	58.37056	41	X	X		X
PL0171A	Pm.63.wDSAa	17.04667	54.46361	25	X	X		X
PL0045A	Gdansk, AM01	18.63528	54.35305	51	X	X		
PL0046A	Gdansk, AM02	18.70111	54.36778	7	X	X		
PL0047A	Gdansk, AM03	18.65722	54.40083	3	X	X		
PL0048A	Gdansk, AM04	18.49333	54.56083	70	X	X		X
PL0049A	Gdansk, AM05	18.55750	54.32833	105	X	X		X
PL0050A	Gdansk, AM06	18.57945	54.43167	5	X	X		
PL0051A	Gdansk, AM07	18.78778	54.08583	41	X	X		
PL0052A	Gdansk, AM08	18.62000	54.38028	40	X	X		X
PL0053A	Gdansk, AM09	18.55000	54.48333	3	X	X		X
PL0558A	AM12	17.96861	54.11889	163	X	X		X
PL0559A	AM15	19.03261	54.03127	17	X	X		X
PL0560A	AM16	17.74643	54.54617	19	X	X		X
PL0311A	Pm.polpharma.01.a	18.53694	53.96584	85	X	X		
PL0295A	Elblag ul. Bazynskiego	19.41083	54.16806	16	X	X		X
PL0312A	Goldap ul. Jacwieska	22.30722	54.30583	167	X	X		X
PL0296A	Parkowa ul. Mragowo	21.29583	53.86611	150		X		
PL0175A	Olsztyn ul. Puszkina	20.48194	53.78778	120	X	X		
PL0176A	Ostróda Pilsudskiego	19.96528	53.69167	120	X	X		X

Table S3: Statistical evaluation of daily mean NO_2 for the year 2012 with three CTMs.

Station Code	N	μ_{Obs}	CMAQ					SILAM					EMEP				
			μ_{Mod}	R	NMB	RMSE	FAC2	μ_{Mod}	R	NMB	RMSE	FAC2	μ_{Mod}	R	NMB	RMSE	FAC2
DEHH033	360	23.5	12.4	0.75	-0.47	13.6	0.45	17.5	0.71	-0.25	10.6	0.71	21.3	0.65	-0.10	8.5	0.93
DEHH047	363	17.9	12.3	0.81	-0.31	8.2	0.71	17.3	0.78	-0.03	7.4	0.87	15.8	0.78	-0.11	5.9	0.94
DEHH059	364	28.6	17.1	0.56	-0.40	14.6	0.62	18.1	0.44	-0.37	15.2	0.59	23.9	0.58	-0.16	9.6	0.92
DEHH074	364	34.1	14.7	0.64	-0.57	21.6	0.29	17.7	0.54	-0.48	19.7	0.44	19.8	0.65	-0.42	16.8	0.62
DEMV004	362	9.3	8.5	0.83	-0.08	4.0	0.90	12.1	0.82	0.30	7.0	0.80	5.8	0.77	-0.37	4.7	0.60
DEMV007	352	11.6	12.7	0.66	0.10	6.2	0.88	13.3	0.64	0.15	7.4	0.78	9.3	0.63	-0.20	5.0	0.85
DEMV012	364	7.0	8.0	0.80	0.14	4.2	0.86	13.3	0.81	0.90	9.3	0.58	5.5	0.71	-0.22	3.6	0.76
DEMV019	364	10.6	9.2	0.73	-0.13	5.1	0.85	13.2	0.75	0.25	7.2	0.80	6.2	0.64	-0.42	6.5	0.60
DEMV021	359	14.9	15.1	0.57	0.01	8.2	0.77	14.3	0.62	-0.04	7.9	0.78	13.1	0.65	-0.13	6.9	0.82
DENI063	364	13.9	12.5	0.80	-0.10	6.3	0.89	16.7	0.75	0.20	7.8	0.86	22.3	0.71	0.61	10.9	0.70
DESH008	364	12.3	10.3	0.82	-0.16	4.7	0.84	12.7	0.82	0.03	5.9	0.80	8.6	0.81	-0.30	5.7	0.71
DESH023	353	15.4	13.2	0.75	-0.14	6.2	0.90	14.6	0.66	-0.05	7.9	0.75	11.7	0.72	-0.24	6.3	0.88
DESH033	363	19.1	13.0	0.78	-0.32	8.5	0.74	13.3	0.73	-0.30	9.2	0.63	17.5	0.70	-0.09	6.4	0.97
DK0045A	358	16.6	14.0	0.24	-0.16	10.5	0.67	12.0	0.28	-0.28	11.1	0.59	18.5	0.23	0.12	10.3	0.79
DK0046A	363	12.9	8.0	0.53	-0.38	8.6	0.55	9.4	0.45	-0.27	9.1	0.54	8.0	0.64	-0.38	7.7	0.66
DK0052A	329	17.2	14.0	0.12	-0.19	12.5	0.59	10.2	0.11	-0.41	13.3	0.48	9.9	0.12	-0.42	12.3	0.53

Table S3. Continued.

DK0053A	364	13.2	8.6	0.72	-0.35	7.7	0.68	7.8	0.66	-0.41	9.4	0.53	10.4	0.79	-0.22	6.1	0.89
DK0054A	329	8.1	10.5	0.19	0.30	10.2	0.57	10.2	0.28	0.27	9.1	0.53	9.0	0.22	0.11	8.2	0.59
EE0009R	363	2.9	3.7	0.79	0.27	2.3	0.74	4.5	0.70	0.55	3.5	0.66	3.0	0.65	0.02	2.4	0.72
EE0011R	359	2.6	3.1	0.71	0.20	1.9	0.79	3.6	0.47	0.40	3.1	0.54	2.4	0.65	-0.07	1.9	0.79
EE0016A	361	2.3	3.4	0.73	0.49	2.6	0.43	4.6	0.71	0.99	3.9	0.39	2.5	0.70	0.07	2.5	0.53
EE0018A	364	11.1	6.9	0.61	-0.38	8.7	0.67	6.5	0.71	-0.42	8.3	0.59	13.5	0.79	0.21	6.9	0.72
EE0021A	363	13.9	3.7	0.70	-0.73	13.6	0.09	5.4	0.65	-0.61	12.3	0.23	4.4	0.64	-0.68	13.1	0.18
EE0022A	362	10.8	4.8	0.47	-0.55	8.9	0.40	6.7	0.42	-0.38	7.9	0.49	6.5	0.59	-0.39	8.1	0.73
FI00301	364	10.3	3.8	0.67	-0.64	8.8	0.30	5.5	0.68	-0.47	7.8	0.54	6.4	0.69	-0.38	6.9	0.73
FI00349	361	3.4	3.6	0.66	0.05	2.4	0.74	3.7	0.32	0.07	3.1	0.53	3.2	0.62	-0.05	1.9	0.84
FI00351	364	5.2	4.2	0.65	-0.19	5.0	0.71	5.0	0.57	-0.03	4.7	0.69	3.5	0.60	-0.33	5.4	0.76
FI00363	364	13.2	3.5	0.53	-0.74	12.3	0.12	4.3	0.64	-0.67	11.3	0.20	3.9	0.60	-0.70	11.8	0.17
FI00372	364	2.7	1.8	0.88	-0.34	2.1	0.54	3.0	0.82	0.10	2.1	0.66	2.1	0.84	-0.24	2.0	0.85
FI00431	346	13.6	3.1	0.37	-0.77	13.3	0.10	4.5	0.33	-0.67	11.9	0.21	4.8	0.44	-0.64	11.6	0.28
FI00781	329	14.3	11.9	0.54	-0.17	9.0	0.80	10.3	0.54	-0.28	9.5	0.77	13.2	0.57	-0.07	8.4	0.84
LT00001	361	21.6	6.0	0.59	-0.72	17.0	0.08	7.9	0.51	-0.63	15.7	0.22	8.9	0.53	-0.59	14.3	0.29
LT00002	359	15.1	6.8	0.67	-0.55	9.6	0.31	8.2	0.59	-0.45	9.1	0.41	8.9	0.65	-0.41	7.8	0.69
LT00012	359	13.8	4.5	0.46	-0.67	11.6	0.18	6.3	0.28	-0.54	11.3	0.30	5.7	0.47	-0.59	10.6	0.38
LT00044	361	9.3	6.4	0.57	-0.32	7.8	0.55	8.4	0.45	-0.10	8.3	0.48	6.9	0.57	-0.26	7.2	0.64

Table S3. Continued.

LV00RP5	344	33.4	8.9	0.35	-0.73	27.4	0.09	9.0	0.37	-0.73	27.3	0.12	19.6	0.50	-0.41	17.5	0.72
LV00VN1	357	16.6	4.6	0.50	-0.72	14.8	0.17	5.9	0.39	-0.64	14.1	0.30	7.0	0.50	-0.58	12.9	0.39
LV0RKE2	364	21.6	8.3	0.64	-0.62	19.0	0.36	9.0	0.70	-0.58	18.0	0.36	19.8	0.73	-0.08	11.8	0.81
PL0045A	361	23.0	15.8	0.24	-0.31	13.1	0.65	13.9	0.37	-0.39	14.2	0.53	17.0	0.31	-0.26	11.6	0.80
PL0046A	344	13.9	13.0	0.22	-0.07	7.8	0.76	14.0	0.30	0.01	9.0	0.70	11.9	0.23	-0.14	7.1	0.82
PL0047A	364	17.7	16.5	0.64	-0.07	8.4	0.86	14.8	0.74	-0.16	8.5	0.82	13.1	0.71	-0.26	8.3	0.87
PL0048A	353	13.7	13.6	0.32	-0.01	10.5	0.65	9.7	0.41	-0.29	10.4	0.47	11.1	0.53	-0.19	7.6	0.79
PL0049A	353	15.4	14.2	0.50	-0.08	8.5	0.82	12.6	0.50	-0.19	9.6	0.61	8.7	0.48	-0.44	9.6	0.57
PL0050A	364	14.9	14.5	0.58	-0.03	9.9	0.72	12.1	0.76	-0.19	7.0	0.68	9.9	0.69	-0.33	7.4	0.77
PL0051A	356	15.7	8.2	0.42	-0.48	10.9	0.43	10.3	0.43	-0.35	11.0	0.43	6.8	0.47	-0.57	11.1	0.37
PL0052A	363	20.1	20.3	0.57	0.01	10.2	0.83	15.0	0.63	-0.25	10.6	0.69	17.0	0.57	-0.15	8.9	0.91
PL0171A	361	13.0	6.5	0.57	-0.50	8.7	0.38	8.6	0.50	-0.34	9.1	0.40	6.1	0.62	-0.53	8.5	0.35
PL0176A	343	14.6	6.7	0.26	-0.54	11.5	0.35	9.1	0.24	-0.38	11.7	0.39	5.4	0.22	-0.63	11.9	0.30
PL0295A	360	14.1	7.7	0.80	-0.45	9.1	0.46	9.8	0.77	-0.30	8.4	0.56	7.7	0.73	-0.45	8.9	0.57
PL0311A	271	20.2	6.5	0.05	-0.68	15.6	0.18	7.1	0.08	-0.65	15.9	0.21	5.4	-0.03	-0.73	16.5	0.11
PL0312A	357	6.7	4.8	0.66	-0.28	4.3	0.68	6.7	0.67	0.00	5.5	0.62	4.1	0.57	-0.39	4.6	0.59
PL0053A	364	17.1	11.0	0.73	-0.35	9.5	0.74	11.3	0.56	-0.34	11.1	0.54	6.2	0.60	-0.64	13.6	0.30
PL0559A	356	14.9	7.8	0.35	-0.47	10.4	0.44	10.5	0.34	-0.30	10.1	0.53	6.7	0.35	-0.55	10.7	0.42
PL0561A	352	5.9	6.4	0.55	0.09	5.2	0.71	8.6	0.56	0.45	7.7	0.57	5.0	0.55	-0.15	3.9	0.70

Table S3. Continued.

SE0001A	360	15.8	10.0	0.60	-0.36	8.4	0.69	10.3	0.64	-0.35	8.5	0.60	9.9	0.65	-0.37	8.1	0.75
SE0022A	364	11.9	9.3	0.61	-0.21	6.3	0.79	6.8	0.60	-0.43	8.1	0.56	12.3	0.55	0.04	6.0	0.78
SE0030A	293	13.4	1.6	0.46	-0.88	16.1	0.02	2.6	0.53	-0.81	15.4	0.10	2.4	0.49	-0.82	15.4	0.08
SE0053A	364	24.9	11.1	0.66	-0.55	16.0	0.37	17.6	0.59	-0.29	12.3	0.63	17.2	0.67	-0.31	11.5	0.84
SE0054A	292	14.4	8.1	0.72	-0.44	8.9	0.57	10.0	0.65	-0.31	8.5	0.65	7.2	0.72	-0.50	9.7	0.53
SE0066A	364	1.1	3.0	0.72	1.75	2.9	0.20	3.6	0.64	2.29	3.9	0.20	3.2	0.66	1.92	2.7	0.15
DEHH008	364	30.1	19.2	0.75	-0.36	13.3	0.69	18.0	0.74	-0.40	14.7	0.52	23.9	0.52	-0.21	11.5	0.91
DEHH049	364	17.3	14.0	0.79	-0.19	7.8	0.84	17.4	0.73	0.01	8.0	0.86	23.6	0.53	0.37	10.8	0.76
PL0066A	337	12.3	7.9	0.39	-0.36	8.5	0.54	10.0	0.46	-0.19	9.3	0.49	5.8	0.42	-0.52	8.8	0.44
PL0558A	348	15.1	6.5	0.37	-0.57	11.4	0.35	8.3	0.46	-0.45	10.8	0.36	5.0	0.39	-0.67	12.3	0.23
PL0560A	363	11.7	6.2	0.45	-0.47	8.8	0.48	8.0	0.45	-0.32	9.2	0.47	4.9	0.49	-0.58	9.3	0.36
PL0077A	345	4.4	6.3	0.35	0.44	5.4	0.65	9.4	0.37	1.14	9.5	0.52	4.9	0.37	0.12	3.2	0.74
SE0004A	345	22.0	12.4	0.15	-0.44	15.6	0.56	10.4	0.24	-0.53	16.3	0.48	7.4	0.37	-0.66	18.1	0.26
FI00208	349	7.4	7.8	0.79	0.06	5.8	0.74	6.7	0.80	-0.09	4.7	0.77	5.7	0.78	-0.22	5.0	0.82

Table S4: Statistical evaluation of daily mean O_3 for the year 2012 with three CTMs.

Station Code	N	μ_{Obs}	CMAQ					SILAM					EMEP				
			μ_{Mod}	R	NMB	RMSE	FAC2	μ_{Mod}	R	NMB	RMSE	FAC2	μ_{Mod}	R	NMB	RMSE	FAC2
DEHH033	354	42.7	51.4	0.83	0.20	15.2	0.90	44.5	0.83	0.04	12.9	0.90	53.6	0.82	0.25	16.1	0.88
DEHH047	363	43.2	51.0	0.83	0.18	14.5	0.91	44.2	0.82	0.02	13.3	0.91	57.0	0.84	0.32	18.0	0.86
DEMV004	362	54.1	53.6	0.80	-0.01	12.7	0.98	50.9	0.80	-0.06	14.2	0.93	63.6	0.79	0.18	15.1	0.95
DEMV007	352	48.5	50.3	0.73	0.04	13.6	0.96	52.3	0.70	0.08	16.3	0.92	64.2	0.71	0.32	20.3	0.92
DEMV012	362	52.4	54.0	0.86	0.03	11.5	0.97	47.9	0.84	-0.09	13.9	0.90	64.8	0.80	0.24	17.1	0.93
DEMV019	364	49.7	53.2	0.82	0.07	12.2	0.97	47.4	0.83	-0.05	12.3	0.93	63.1	0.78	0.27	17.8	0.92
DENI063	360	46.1	49.6	0.81	0.08	11.9	0.94	44.0	0.82	-0.05	12.6	0.92	51.6	0.77	0.12	13.1	0.95
DESH001	363	43.7	51.1	0.77	0.17	14.7	0.94	45.2	0.80	0.03	13.7	0.92	59.8	0.78	0.37	20.0	0.89
DESH008	364	53.4	52.3	0.81	-0.02	12.7	0.96	51.6	0.82	-0.03	13.5	0.94	62.2	0.83	0.16	14.3	0.96
DESH013	364	58.6	56.1	0.74	-0.04	13.6	0.98	57.3	0.77	-0.02	14.1	0.97	66.9	0.79	0.14	14.1	0.98
DESH015	364	44.5	51.6	0.79	0.16	14.4	0.95	49.4	0.78	0.11	15.0	0.90	62.2	0.83	0.40	20.6	0.88
DESH016	364	43.4	49.6	0.81	0.14	13.8	0.92	44.2	0.80	0.02	13.6	0.87	57.9	0.82	0.33	18.5	0.88
DESH023	353	50.4	50.0	0.80	-0.01	12.8	0.97	49.2	0.79	-0.02	14.6	0.91	62.0	0.82	0.23	16.1	0.94
DESH033	364	47.9	51.1	0.81	0.07	12.8	0.94	52.4	0.80	0.10	14.1	0.93	57.4	0.78	0.20	15.2	0.94
DK0046A	359	56.3	56.9	0.57	0.01	18.3	0.91	58.7	0.51	0.04	19.9	0.89	64.7	0.65	0.15	17.8	0.92
DK0052A	351	51.7	52.0	0.50	0.00	19.5	0.87	57.5	0.48	0.11	20.7	0.89	65.2	0.60	0.26	21.6	0.89

Table S4. Continued.

DK0053A	327	55.5	58.3	0.60	0.05	17.4	0.92	62.4	0.62	0.13	17.6	0.91	66.0	0.52	0.19	19.5	0.91
DK0054A	356	59.4	55.5	0.46	-0.07	19.9	0.89	57.8	0.56	-0.03	18.8	0.91	67.0	0.60	0.13	18.3	0.93
EE0009R	363	55.9	53.8	0.69	-0.04	14.1	0.96	59.2	0.78	0.06	12.4	0.99	65.8	0.71	0.18	15.5	0.98
EE0011R	359	66.9	60.7	0.81	-0.09	12.9	0.99	67.8	0.79	0.01	13.1	1.00	74.8	0.83	0.12	12.6	1.00
EE0016A	361	52.4	53.9	0.66	0.03	15.4	0.94	57.1	0.79	0.09	12.5	0.98	64.9	0.70	0.24	17.2	0.95
EE0018A	363	50.4	51.8	0.68	0.03	14.2	0.97	60.4	0.68	0.20	17.7	0.96	60.6	0.73	0.20	15.7	0.96
EE0021A	363	47.9	53.4	0.78	0.12	14.1	0.94	56.4	0.75	0.18	16.1	0.93	64.1	0.75	0.34	20.5	0.86
EE0022A	349	51.2	52.2	0.81	0.02	11.4	0.97	54.6	0.80	0.07	12.3	0.97	62.4	0.76	0.22	16.4	0.93
FI00301	364	48.2	44.2	0.77	-0.08	12.4	0.95	51.1	0.74	0.06	12.8	0.97	57.8	0.77	0.20	15.1	0.95
FI00349	360	65.6	59.5	0.74	-0.09	13.5	0.99	67.4	0.71	0.03	13.7	1.00	75.0	0.79	0.14	13.5	1.00
FI00351	364	55.6	52.0	0.72	-0.06	14.7	0.96	58.2	0.76	0.05	13.5	0.97	66.3	0.69	0.19	17.4	0.94
FI00363	347	48.5	50.8	0.77	0.05	12.4	0.97	54.7	0.71	0.13	14.9	0.93	63.3	0.79	0.30	18.3	0.89
FI00372	356	52.5	51.0	0.79	-0.03	11.3	0.99	55.8	0.80	0.06	10.9	1.00	62.3	0.78	0.19	14.8	0.98
FI00431	362	39.6	50.6	0.75	0.28	16.9	0.91	54.7	0.74	0.38	19.4	0.87	61.7	0.79	0.56	24.6	0.80
FI00781	332	46.4	47.1	0.72	0.01	13.0	0.92	55.7	0.72	0.20	16.6	0.91	58.5	0.74	0.26	17.0	0.90
FI00867	361	45.5	51.5	0.74	0.13	14.5	0.94	54.4	0.80	0.20	14.1	0.94	62.8	0.77	0.38	20.8	0.88
LT00002	359	47.1	53.8	0.74	0.14	17.7	0.89	54.5	0.71	0.16	18.3	0.89	61.2	0.75	0.30	20.3	0.84
LT00012	319	43.7	53.2	0.71	0.22	18.5	0.89	55.3	0.73	0.26	18.6	0.88	61.9	0.73	0.42	22.9	0.82
LT00044	364	43.0	53.6	0.84	0.25	16.2	0.91	55.2	0.72	0.29	19.2	0.86	61.6	0.79	0.43	22.1	0.80

Table S4. Continued.

LT00051	338	57.0	56.2	0.66	-0.01	18.4	0.90	56.3	0.75	-0.01	16.2	0.95	66.4	0.71	0.17	19.0	0.90
LT00052	338	51.1	54.9	0.68	0.07	18.1	0.90	55.4	0.71	0.08	16.8	0.93	65.1	0.69	0.27	21.3	0.87
LT00053	343	47.0	57.8	0.70	0.23	19.0	0.92	61.6	0.71	0.31	20.8	0.93	68.5	0.68	0.46	25.6	0.85
LT00054	362	63.1	61.3	0.77	-0.03	14.1	0.97	64.1	0.73	0.02	16.1	0.97	74.7	0.80	0.18	16.8	0.98
LV00010	346	69.7	58.4	0.74	-0.16	19.8	0.91	64.3	0.75	-0.08	16.6	0.97	70.6	0.65	0.01	16.9	0.98
LV00016	364	71.1	55.4	0.62	-0.22	23.7	0.86	57.7	0.73	-0.19	19.8	0.94	65.3	0.66	-0.08	16.0	1.00
LV00RP5	336	58.7	52.6	0.80	-0.10	16.4	0.90	57.7	0.72	-0.02	16.9	0.93	52.9	0.77	-0.10	16.0	0.95
LV00VN1	350	49.8	56.9	0.68	0.14	16.2	0.94	64.5	0.66	0.29	21.3	0.90	71.2	0.69	0.43	25.3	0.86
LV0RKE2	364	58.8	52.0	0.73	-0.12	16.5	0.88	56.9	0.78	-0.03	12.8	0.97	52.6	0.74	-0.11	14.6	0.95
PL0004R	364	58.5	59.6	0.78	0.02	12.4	0.98	62.1	0.75	0.06	16.0	0.96	71.6	0.80	0.22	17.2	0.98
PL0005R	364	58.5	56.3	0.74	-0.04	15.9	0.95	56.6	0.71	-0.03	16.0	0.96	66.5	0.77	0.14	15.9	0.96
PL0048A	364	48.4	52.5	0.79	0.08	13.1	0.97	59.4	0.80	0.23	17.7	0.93	63.2	0.82	0.31	18.2	0.91
PL0049A	363	44.4	50.3	0.66	0.13	17.2	0.90	55.2	0.65	0.24	20.9	0.87	63.3	0.73	0.43	23.2	0.83
PL0052A	360	41.7	45.3	0.58	0.09	18.0	0.86	54.1	0.63	0.30	22.5	0.81	56.3	0.71	0.35	20.5	0.83
PL0066A	301	46.3	59.2	0.66	0.28	21.3	0.82	60.4	0.61	0.30	23.7	0.80	66.5	0.47	0.43	27.8	0.75
PL0077A	361	49.9	54.3	0.66	0.09	17.5	0.91	54.2	0.63	0.09	19.6	0.87	65.0	0.61	0.30	22.5	0.86
PL0171A	321	47.6	60.1	0.59	0.26	21.3	0.86	62.1	0.56	0.30	23.6	0.86	68.8	0.42	0.44	28.1	0.79
PL0295A	360	54.9	55.1	0.84	0.00	14.7	0.93	56.2	0.83	0.02	15.6	0.93	62.6	0.85	0.14	16.4	0.91
PL0053A	363	47.4	53.9	0.80	0.14	13.7	0.96	57.6	0.76	0.22	17.9	0.92	65.9	0.79	0.39	21.8	0.88

Table S4. Continued.

PL0558A	357	37.6	55.4	0.44	0.48	27.1	0.69	57.4	0.45	0.53	29.2	0.68	65.6	0.54	0.75	33.0	0.57
PL0559A	356	47.2	54.0	0.69	0.14	17.9	0.91	55.3	0.65	0.17	19.6	0.90	61.3	0.67	0.30	20.1	0.90
PL0561A	354	58.3	56.2	0.74	-0.04	15.6	0.94	57.6	0.76	-0.01	16.1	0.93	64.8	0.74	0.11	15.4	0.95
SE0001A	364	55.4	55.4	0.78	0.00	13.1	0.98	59.8	0.73	0.08	15.4	0.94	67.3	0.81	0.21	16.5	0.93
SE0022A	364	48.7	52.4	0.80	0.08	12.4	0.96	61.4	0.75	0.26	18.1	0.92	59.3	0.79	0.22	15.3	0.96
SE0053A	364	53.1	53.4	0.76	0.01	13.1	0.98	52.3	0.62	-0.02	16.1	0.94	59.5	0.78	0.12	12.5	0.98
SE0054A	292	41.1	55.7	0.75	0.35	19.7	0.93	57.3	0.71	0.39	21.7	0.88	62.9	0.81	0.53	24.1	0.86
SE0066A	364	53.7	55.6	0.73	0.04	12.9	0.96	60.8	0.73	0.13	14.3	0.98	64.5	0.77	0.20	15.1	0.98
DEHH008	364	38.7	45.4	0.83	0.17	14.0	0.89	43.5	0.82	0.12	13.8	0.89	52.3	0.81	0.35	18.8	0.81
DEMV021	359	53.3	49.5	0.77	-0.07	15.2	0.96	52.2	0.78	-0.02	14.2	0.93	61.4	0.73	0.15	16.1	0.92
DK0045A	358	55.9	52.2	0.59	-0.07	19.1	0.89	59.0	0.60	0.06	19.2	0.91	58.6	0.61	0.05	17.4	0.92
FI00586	363	52.5	51.4	0.84	-0.02	11.1	0.96	58.4	0.78	0.11	13.2	0.95	62.8	0.81	0.20	15.0	0.94
SE0005R	364	56.0	49.2	0.75	-0.12	14.5	0.92	56.9	0.80	0.02	11.1	0.98	62.1	0.82	0.11	12.3	0.99
SE0011R	358	59.8	57.5	0.82	-0.04	11.7	1.00	59.8	0.81	0.00	12.2	0.99	66.8	0.81	0.12	13.0	0.99
SE0012R	363	52.9	58.4	0.74	0.10	13.6	0.98	62.5	0.76	0.18	15.5	0.98	66.6	0.74	0.26	17.6	0.97
SE0014R	364	63.0	57.3	0.71	-0.09	15.0	0.98	62.5	0.64	-0.01	15.6	0.97	71.2	0.82	0.13	13.4	0.99
SE0032R	335	62.9	57.8	0.78	-0.08	13.6	0.99	58.8	0.73	-0.06	13.8	0.99	66.7	0.85	0.06	9.8	1.00
SE0035R	357	55.3	49.5	0.75	-0.10	13.4	0.96	55.2	0.76	0.00	11.5	0.99	62.1	0.75	0.12	13.4	0.98
DEHH049	364	45.1	49.8	0.78	0.10	13.9	0.93	44.0	0.79	-0.02	14.1	0.90	51.1	0.77	0.13	14.3	0.91

Table S4. Continued.

PL0176A	350	54.6	55.2	0.69	0.01	16.8	0.91	55.8	0.61	0.02	18.9	0.91	63.5	0.67	0.16	17.6	0.92
PL0560A	364	47.8	56.6	0.73	0.18	16.9	0.92	59.0	0.65	0.24	21.0	0.88	66.3	0.77	0.39	22.4	0.84
FI00208	342	52.4	48.8	0.77	-0.07	13.3	0.92	57.4	0.78	0.10	13.6	0.94	63.4	0.78	0.21	16.0	0.94
FI00453	312	53.0	51.3	0.75	-0.03	12.5	0.97	55.3	0.74	0.04	12.3	0.97	61.6	0.80	0.16	13.5	0.98
SE0004A	325	58.3	52.1	0.74	-0.11	16.8	0.94	58.5	0.73	0.00	16.0	0.94	66.9	0.78	0.15	17.0	0.91

Table S5: Statistical evaluation of daily mean SO_2 for the year 2012 with three CTMs.

Station Code	N	μ_{Obs}	CMAQ					SILAM					EMEP				
			μ_{Mod}	R	NMB	RMSE	FAC2	μ_{Mod}	R	NMB	RMSE	FAC2	μ_{Mod}	R	NMB	RMSE	FAC2
DEHH059	364	4.3	6.0	-0.05	0.37	4.2	0.64	4.6	-0.12	0.07	4.0	0.71	4.1	-0.06	-0.07	3.5	0.69
DEHH079	362	5.5	5.1	0.49	-0.07	4.1	0.72	4.6	0.53	-0.17	4.3	0.77	4.1	0.18	-0.26	4.1	0.67
DEMV004	362	1.2	1.8	0.72	0.51	1.6	0.67	2.5	0.69	1.09	3.2	0.64	0.9	0.69	-0.21	1.0	0.46
DEMV007	352	1.7	2.4	0.35	0.41	1.8	0.68	2.7	0.37	0.62	2.8	0.67	1.7	0.31	-0.01	1.3	0.76
DEMV012	364	2.0	3.9	0.72	0.97	4.0	0.53	5.4	0.70	1.73	5.5	0.38	1.7	0.67	-0.17	2.0	0.37
DEMV021	364	1.6	2.7	0.47	0.68	1.9	0.61	2.8	0.64	0.78	2.7	0.67	2.5	0.35	0.53	1.5	0.68
DESH023	351	1.6	2.8	0.44	0.71	2.2	0.61	3.2	0.32	0.98	3.2	0.50	1.6	0.42	-0.01	1.2	0.77
EE0009R	360	1.4	1.4	0.53	0.05	1.6	0.64	2.1	0.56	0.57	2.2	0.62	0.7	0.51	-0.50	1.7	0.40
EE0011R	359	0.7	0.9	0.68	0.44	0.9	0.65	1.4	0.56	1.16	1.6	0.52	0.5	0.51	-0.22	0.8	0.73
EE0016A	351	0.7	1.3	0.67	0.86	1.4	0.37	2.0	0.66	1.86	2.6	0.25	0.6	0.57	-0.13	1.1	0.55
EE0018A	364	1.0	1.9	0.72	0.86	1.5	0.35	2.5	0.72	1.50	2.4	0.30	1.5	0.62	0.51	1.3	0.46
EE0021A	363	1.2	1.3	0.55	0.07	1.4	0.61	2.3	0.61	0.90	2.7	0.61	0.8	0.58	-0.37	1.2	0.50
EE0022A	364	1.6	2.9	0.31	0.85	2.7	0.46	5.4	0.36	2.38	5.5	0.27	3.4	0.35	1.15	2.8	0.32
FI00349	356	0.8	1.0	0.70	0.22	0.8	0.73	1.4	0.63	0.66	1.4	0.68	0.5	0.53	-0.34	0.9	0.79
FI00351	364	1.4	1.4	0.71	-0.04	1.5	0.62	2.2	0.74	0.55	2.0	0.49	0.7	0.64	-0.49	1.8	0.55
LT00001	360	2.7	3.6	0.36	0.34	2.8	0.62	4.5	0.38	0.66	3.4	0.57	2.5	0.40	-0.08	1.9	0.62

Table S5. Continued.

LT00002	349	2.1	4.3	0.55	1.06	3.5	0.45	4.6	0.57	1.24	4.0	0.44	2.5	0.62	0.22	1.5	0.71
LT00044	293	4.2	4.0	0.26	-0.03	7.2	0.37	4.5	0.33	0.09	7.6	0.33	2.0	0.24	-0.52	7.1	0.35
LV00RP5	341	3.2	1.9	0.68	-0.40	2.6	0.49	2.3	0.67	-0.29	2.2	0.50	1.1	0.66	-0.65	2.8	0.19
LV00VN1	355	3.5	1.3	0.20	-0.62	3.8	0.27	1.9	0.26	-0.45	3.6	0.38	1.1	0.29	-0.69	3.8	0.29
LV0RKE2	364	3.2	1.8	-0.04	-0.43	2.7	0.34	2.3	0.00	-0.28	2.5	0.40	1.1	-0.13	-0.64	2.7	0.23
PL0045A	361	7.8	13.6	0.23	0.75	10.9	0.62	11.3	0.35	0.45	8.4	0.71	6.6	0.35	-0.15	4.8	0.71
PL0046A	364	7.1	11.3	0.32	0.60	9.1	0.52	10.1	0.29	0.43	8.3	0.50	4.7	0.55	-0.34	5.3	0.65
PL0047A	364	5.4	9.7	0.67	0.79	8.3	0.59	8.8	0.73	0.61	7.1	0.66	5.4	0.62	0.00	3.9	0.81
PL0048A	364	4.1	6.5	0.61	0.60	6.0	0.59	5.8	0.71	0.41	5.1	0.63	4.3	0.65	0.05	2.9	0.81
PL0049A	364	3.4	10.9	0.65	2.24	10.9	0.31	9.4	0.73	1.80	8.9	0.37	4.2	0.60	0.24	3.2	0.64
PL0050A	364	3.9	7.6	0.59	0.95	8.2	0.49	8.9	0.70	1.29	7.8	0.44	5.0	0.72	0.29	3.8	0.73
PL0051A	356	4.9	5.3	0.38	0.08	4.8	0.66	5.6	0.38	0.15	4.8	0.64	2.9	0.58	-0.40	3.7	0.39
PL0052A	364	5.3	9.9	0.62	0.89	8.5	0.57	10.3	0.72	0.95	8.4	0.54	6.6	0.72	0.26	3.7	0.84
PL0171A	361	8.0	3.8	0.39	-0.53	6.1	0.33	3.8	0.40	-0.53	6.3	0.31	2.6	0.46	-0.68	6.6	0.18
PL0175A	325	3.5	6.8	0.41	0.95	6.0	0.40	7.4	0.34	1.11	6.4	0.37	2.9	0.42	-0.18	3.6	0.46
PL0176A	341	3.4	4.7	0.38	0.39	4.3	0.58	5.0	0.40	0.49	4.5	0.55	2.4	0.39	-0.29	3.3	0.44
PL0295A	314	3.9	6.4	0.20	0.65	5.4	0.61	5.7	0.16	0.46	4.4	0.60	3.3	0.21	-0.16	3.0	0.54
PL0311A	356	5.3	5.1	0.47	-0.04	4.8	0.60	5.0	0.47	-0.06	4.6	0.57	2.9	0.68	-0.45	3.8	0.38
PL0312A	324	4.1	2.5	0.36	-0.40	3.8	0.44	2.9	0.40	-0.30	3.3	0.53	1.4	0.50	-0.66	4.0	0.24

Table S5. Continued.

PL0053A	364	4.0	10.1	0.68	1.50	9.3	0.43	8.4	0.73	1.07	7.2	0.57	2.7	0.77	-0.34	2.6	0.45
PL0558A	351	7.0	3.9	0.36	-0.44	6.4	0.46	4.0	0.39	-0.42	6.2	0.44	2.0	0.65	-0.71	6.8	0.17
PL0559A	344	4.7	5.2	0.40	0.10	4.6	0.63	5.8	0.40	0.23	4.1	0.70	3.1	0.49	-0.35	3.3	0.43
PL0560A	364	5.8	3.7	0.57	-0.37	3.9	0.45	3.8	0.62	-0.35	3.6	0.46	2.0	0.54	-0.65	4.6	0.21
PL0561A	351	4.7	3.8	0.31	-0.20	4.2	0.50	4.1	0.30	-0.14	4.3	0.52	2.1	0.37	-0.55	4.1	0.32
SE0001A	359	1.3	1.6	0.43	0.21	1.0	0.79	2.0	0.38	0.57	1.8	0.75	1.1	0.48	-0.18	0.7	0.73
SE0054A	292	1.2	1.5	0.65	0.24	0.9	0.79	2.0	0.61	0.70	1.7	0.69	0.8	0.56	-0.33	0.8	0.65
DEHH008	364	4.3	5.1	0.67	0.20	3.3	0.79	4.6	0.69	0.08	3.9	0.83	4.1	0.21	-0.05	3.5	0.75
LT00021	340	1.8	2.5	0.41	0.38	2.1	0.61	2.8	0.34	0.53	2.8	0.57	1.9	0.26	0.07	1.5	0.62
PL0077A	278	2.5	3.0	-0.02	0.22	3.8	0.50	3.8	0.01	0.55	4.9	0.47	1.6	-0.06	-0.35	3.1	0.33
SE0004A	290	1.7	1.9	0.17	0.14	1.4	0.69	2.2	0.11	0.32	1.6	0.66	0.7	0.22	-0.61	1.5	0.30
FI00208	293	1.8	2.9	0.67	0.61	2.2	0.62	3.3	0.73	0.84	3.1	0.61	1.0	0.66	-0.45	1.3	0.46

Table S6: Significance of the ship contribution to ambient NO_2 with three CTMs. Correlation between observations and model data without ship contribution is denoted by R_1 and with ship contribution R_2, p_{corr} is the probability and s_{corr} is the significance of the correlation improvement (0: not significant, blue-shaded; 1: 0.9 level, yellow shaded; 2: 0.95, orange shaded). The probability that the mean concentration difference ("noship" - "base") is significantly equal or greater than zero is denoted as p_{bias} where a value below 0.05 confirms the hypothesis of ship influence (orange shaded).

Station Code	CMAQ					SILAM					EMEP				
	R_1	R_2	p_{corr}	s_{corr}	p_{bias}	R_1	R_2	p_{corr}	s_{corr}	p_{bias}	R_1	R_2	p_{corr}	s_{corr}	p_{bias}
DEHH033	0.78	0.69	0.004	0	0	0.73	0.62	0.003	0	0	0.64	0.68	0.828	0	0
DEHH047	0.82	0.75	0.007	0	0	0.77	0.68	0.005	0	0	0.79	0.79	0.500	0	0
DEHH059	0.55	0.56	0.577	0	0	0.41	0.44	0.689	0	0	0.59	0.61	0.663	0	0
DEHH074	0.63	0.59	0.196	0	0	0.51	0.50	0.428	0	0	0.66	0.65	0.407	0	0
DEMV004	0.84	0.78	0.009	0	0	0.82	0.80	0.218	0	0	0.74	0.80	0.976	2	0
DEMV007	0.65	0.63	0.327	0	0	0.59	0.66	0.936	1	0	0.63	0.68	0.877	0	0
DEMV012	0.83	0.77	0.012	0	0	0.83	0.80	0.115	0	0	0.73	0.80	0.989	2	0
DEMV019	0.77	0.72	0.065	0	0	0.78	0.75	0.165	0	0	0.64	0.70	0.929	1	0
DEMV021	0.62	0.53	0.036	0	0	0.54	0.61	0.919	1	0	0.55	0.64	0.968	2	0
DENI063	0.81	0.72	0.002	0	0	0.75	0.72	0.190	0	0	0.72	0.69	0.211	0	0
DESH008	0.82	0.82	0.500	0	0	0.82	0.76	0.015	0	0	0.81	0.80	0.351	0	0
DESH023	0.64	0.71	0.956	2	0	0.62	0.60	0.337	0	0	0.66	0.72	0.936	1	0
DESH033	0.73	0.76	0.817	0	0	0.68	0.64	0.171	0	0	0.68	0.72	0.854	0	0
DK0045A	0.30	0.21	0.100	0	0	0.27	0.20	0.162	0	0	0.29	0.20	0.101	0	0

Table S6. Continued.

DK0046A	0.46	0.41	0.204	0	0	0.44	0.36	0.100	0	0	0.60	0.54	0.116	0	0
DK0052A	0.16	0.11	0.258	0	0	0.13	0.07	0.219	0	0	0.16	0.18	0.604	0	0
DK0053A	0.68	0.65	0.235	0	0	0.62	0.38	0.000	0	0	0.75	0.77	0.738	0	0
DK0054A	0.27	0.12	0.023	0	0	0.28	0.26	0.391	0	0	0.24	0.13	0.073	0	0
EE0009R	0.71	0.70	0.395	0	0	0.67	0.75	0.985	2	0	0.66	0.57	0.026	0	0
EE0011R	0.46	0.70	1.000	2	0	0.35	0.54	0.999	2	0	0.39	0.53	0.991	2	0
EE0016A	0.71	0.66	0.103	0	0	0.71	0.70	0.395	0	0	0.69	0.56	0.002	0	0
EE0018A	0.70	0.48	0.000	0	0	0.68	0.60	0.034	0	0	0.80	0.67	0.000	0	0
EE0021A	0.70	0.51	0.000	0	0	0.66	0.49	0.000	0	0	0.65	0.62	0.250	0	0
EE0022A	0.45	0.61	0.999	2	0	0.42	0.59	0.999	2	0	0.63	0.53	0.021	0	0
FI00301	0.69	0.65	0.164	0	0	0.70	0.48	0.000	0	1.00	0.70	0.65	0.108	0	0
FI00349	0.28	0.57	1.000	2	0	0.19	0.29	0.922	1	0	0.32	0.57	1.000	2	0
FI00351	0.59	0.62	0.738	0	0	0.49	0.61	0.990	2	0	0.53	0.61	0.945	1	0
FI00363	0.56	0.47	0.050	0	0	0.67	0.54	0.003	0	0.50	0.60	0.58	0.340	0	0
FI00372	0.88	0.76	0.000	0	0	0.82	0.80	0.217	0	0	0.83	0.75	0.002	0	0
FI00431	0.40	0.52	0.977	2	0	0.35	0.58	1.000	2	0	0.44	0.65	1.000	2	0
FI00781	0.60	0.47	0.010	0	0	0.57	0.45	0.019	0	0	0.59	0.50	0.051	0	0
LT00001	0.60	0.55	0.159	0	0	0.52	0.45	0.110	0	0.96	0.53	0.56	0.716	0	0
LT00002	0.67	0.66	0.405	0	0	0.61	0.58	0.268	0	1.00	0.65	0.66	0.592	0	0

Table S6. Continued.

LT00012	0.49	0.40	0.067	0	0	0.33	0.23	0.074	0	0.58	0.49	0.43	0.155	0	0
LT00044	0.57	0.52	0.170	0	0	0.47	0.50	0.700	0	1.00	0.57	0.63	0.895	0	0
LV00RP5	0.42	0.42	0.500	0	0	0.43	0.42	0.437	0	0.98	0.53	0.63	0.976	2	0
LV00VN1	0.48	0.41	0.123	0	0	0.33	0.26	0.154	0	0	0.39	0.47	0.904	1	0
LV0RKE2	0.66	0.57	0.025	0	0	0.71	0.61	0.008	0	1.00	0.75	0.77	0.738	0	0
PL0045A	0.36	0.19	0.007	0	0	0.39	0.32	0.142	0	0	0.39	0.22	0.006	0	0
PL0046A	0.32	0.25	0.160	0	0	0.34	0.31	0.331	0	0	0.31	0.21	0.080	0	0
PL0047A	0.67	0.54	0.003	0	0	0.66	0.55	0.010	0	0	0.73	0.61	0.002	0	0
PL0048A	0.40	0.22	0.004	0	0	0.39	0.36	0.322	0	0	0.54	0.46	0.079	0	0
PL0049A	0.44	0.41	0.314	0	0	0.49	0.44	0.199	0	0.12	0.51	0.45	0.151	0	0
PL0050A	0.71	0.42	0.000	0	0	0.76	0.60	0.000	0	0	0.78	0.70	0.008	0	0
PL0051A	0.44	0.37	0.133	0	0	0.41	0.36	0.218	0	0.72	0.47	0.46	0.433	0	0
PL0052A	0.61	0.49	0.010	0	0	0.63	0.51	0.008	0	0	0.66	0.47	0.000	0	0
PL0171A	0.50	0.49	0.430	0	0	0.45	0.44	0.434	0	0	0.54	0.60	0.883	0	0
PL0175A	0.45	0.44	0.436	0	0	0.36	0.39	0.674	0	0.99	0.39	0.45	0.826	0	0
PL0176A	0.27	0.23	0.289	0	0	0.24	0.20	0.292	0	0.05	0.23	0.21	0.392	0	0
PL0295A	0.77	0.62	0.000	0	0	0.74	0.60	0.000	0	0.50	0.71	0.67	0.154	0	0
PL0311A	0.06	0.06	0.500	0	0	0.08	0.02	0.243	0	0	-0.03	-0.07	0.321	0	0
PL0312A	0.62	0.55	0.078	0	0	0.66	0.53	0.004	0	0	0.55	0.53	0.354	0	0

Table S6. Continued.

PL0053A	0.64	0.64	0.500	0	0	0.55	0.41	0.007	0	0.01	0.62	0.53	0.035	0	0
PL0559A	0.34	0.35	0.560	0	0	0.31	0.42	0.954	2	0.92	0.32	0.32	0.500	0	0
PL0561A	0.52	0.44	0.085	0	0	0.54	0.55	0.575	0	0	0.52	0.52	0.500	0	0
SE0001A	0.68	0.62	0.082	0	0	0.63	0.55	0.050	0	0	0.64	0.67	0.759	0	0
SE0022A	0.52	0.65	0.996	2	0	0.53	0.39	0.008	0	0	0.58	0.60	0.660	0	0
SE0030A	0.55	0.28	0.000	0	0	0.58	0.21	0.000	0	0	0.53	0.34	0.002	0	0
SE0053A	0.66	0.65	0.407	0	0	0.55	0.49	0.134	0	0	0.63	0.60	0.258	0	0
SE0054A	0.76	0.68	0.022	0	0	0.64	0.54	0.032	0	0	0.71	0.69	0.319	0	0
SE0066A	0.60	0.41	0.000	0	0	0.51	0.39	0.021	0	0	0.58	0.50	0.064	0	0
DEHH008	0.81	0.72	0.002	0	0	0.75	0.64	0.002	0	0	0.57	0.51	0.127	0	0
DEHH049	0.81	0.69	0.000	0	0	0.73	0.69	0.139	0	0	0.53	0.54	0.575	0	0
PL0066A	0.37	0.37	0.500	0	0	0.43	0.36	0.142	0	0.73	0.40	0.41	0.561	0	0
PL0558A	0.36	0.38	0.620	0	0	0.44	0.48	0.747	0	0	0.38	0.42	0.734	0	0
PL0560A	0.43	0.39	0.259	0	0	0.43	0.34	0.078	0	0	0.46	0.46	0.500	0	0
PL0077A	0.32	0.52	0.999	2	0	0.36	0.53	0.997	2	0	0.34	0.52	0.998	2	0
SE0004A	0.55	0.24	0.000	0	0	0.45	0.20	0.000	0	0	0.54	0.38	0.004	0	0
FI00208	0.81	0.60	0.000	0	0	0.78	0.67	0.001	0	0	0.74	0.73	0.387	0	0

Table S7: Statistical evaluation of daily mean $PM_{2.5}$ in summer with three CTMs.

Station Code	*N*	μ_{Obs}	CMAQ					SILAM					EMEP				
			μ_{Mod}	*R*	NMB	RMSE	FAC2	μ_{Mod}	*R*	NMB	RMSE	FAC2	μ_{Mod}	*R*	NMB	RMSE	FAC2
DEHH008	92	9.8	5.0	0.72	-0.50	5.8	0.50	9.7	0.79	-0.01	3.9	0.95	8.2	0.74	-0.16	3.9	0.93
DEHH059	92	10.1	4.6	0.71	-0.54	6.3	0.35	9.8	0.86	-0.03	3.3	0.95	8.2	0.75	-0.18	3.9	0.93
DEMV019	92	9.8	3.0	0.72	-0.69	7.3	0.03	9.2	0.76	-0.06	5.1	0.79	5.2	0.58	-0.47	5.7	0.45
DEMV021	92	8.5	3.5	0.70	-0.59	5.6	0.22	8.3	0.72	-0.03	5.3	0.82	5.9	0.62	-0.30	4.1	0.73
DESH023	88	9.6	3.8	0.71	-0.61	6.9	0.23	9.1	0.83	-0.05	4.2	0.90	6.5	0.76	-0.32	4.3	0.81
FI00208	85	6.4	3.3	0.48	-0.48	4.2	0.45	9.2	0.47	0.45	5.7	0.81	3.5	0.52	-0.45	3.8	0.61
FI00349	90	4.6	1.8	0.73	-0.61	3.3	0.20	8.2	0.40	0.76	6.5	0.63	4.2	0.58	-0.10	2.2	0.84
FI00351	92	7.5	1.7	0.42	-0.77	6.7	0.03	8.7	0.33	0.16	5.9	0.77	3.3	0.64	-0.56	5.1	0.36
FI00586	92	5.1	1.4	0.33	-0.73	4.6	0.12	10.3	0.65	1.03	7.1	0.50	2.7	0.48	-0.48	3.8	0.58
FI00761	92	5.2	2.2	0.40	-0.58	3.7	0.35	8.4	0.57	0.62	5.6	0.72	3.5	0.44	-0.33	2.8	0.75
FI00781	92	5.7	5.2	0.37	-0.10	3.7	0.70	14.8	0.55	1.58	11.8	0.29	5.0	0.63	-0.13	2.4	0.90
LT00044	92	7.4	4.3	0.61	-0.42	4.5	0.65	9.3	0.67	0.26	4.8	0.80	5.1	0.74	-0.31	3.4	0.84
SE0001A	85	9.9	3.3	0.61	-0.67	7.8	0.22	8.2	0.47	-0.17	6.4	0.61	5.9	0.67	-0.41	5.6	0.59
SE0011R	88	6.4	2.6	0.63	-0.60	4.6	0.27	7.3	0.48	0.14	5.4	0.73	4.5	0.57	-0.29	3.5	0.70
SE0012R	92	5.7	1.7	0.70	-0.70	4.4	0.08	7.5	0.36	0.31	4.8	0.79	3.5	0.54	-0.39	3.1	0.57
SE0022A	92	4.6	2.9	0.53	-0.38	2.4	0.74	8.7	0.36	0.88	6.0	0.63	4.9	0.61	0.06	1.8	0.96
SE0066A	79	3.1	1.6	0.48	-0.48	2.3	0.54	8.0	0.34	1.55	6.8	0.37	3.3	0.48	0.06	1.9	0.75

Table S8: Statistical evaluation of daily mean $PM_{2.5}$ in autumn with three CTMs.

Station Code	*N*	μ_{Obs}	CMAQ					SILAM					EMEP				
			μ_{Mod}	*R*	NMB	RMSE	FAC2	μ_{Mod}	*R*	NMB	RMSE	FAC2	μ_{Mod}	*R*	NMB	RMSE	FAC2
DEHH008	89	10.3	10.7	0.73	0.04	6.4	0.88	12.1	0.65	0.18	6.1	0.90	12.7	0.73	0.23	7.9	0.87
DEHH059	89	11.7	10.2	0.72	-0.13	6.6	0.79	12.1	0.72	0.04	5.5	0.93	12.7	0.71	0.08	7.5	0.87
DEMV019	89	11.4	7.5	0.75	-0.34	6.4	0.46	10.3	0.62	-0.10	6.6	0.83	9.9	0.68	-0.13	6.6	0.75
DEMV021	88	10.5	7.5	0.83	-0.29	5.5	0.59	9.3	0.75	-0.11	6.0	0.88	9.6	0.77	-0.08	6.2	0.76
DESH023	89	9.5	8.6	0.78	-0.09	5.6	0.84	10.6	0.67	0.12	5.7	0.66	10.9	0.72	0.15	7.2	0.81
FI00208	89	4.9	8.1	0.43	0.66	7.3	0.60	7.1	0.60	0.45	4.4	0.66	4.2	0.54	-0.14	3.2	0.69
FI00349	89	4.0	2.8	0.52	-0.31	3.7	0.60	5.1	0.72	0.26	4.0	0.57	3.3	0.61	-0.18	3.7	0.65
FI00351	89	5.4	3.4	0.60	-0.36	3.6	0.44	5.8	0.59	0.08	3.4	0.73	3.3	0.60	-0.38	3.6	0.53
FI00586	89	4.7	3.0	0.65	-0.36	3.3	0.57	4.9	0.34	0.05	4.0	0.56	2.6	0.53	-0.45	3.8	0.52
FI00761	89	5.2	4.7	0.59	-0.10	3.3	0.72	6.0	0.47	0.15	4.0	0.65	3.9	0.51	-0.24	3.3	0.65
FI00781	88	5.6	7.5	0.56	0.35	5.1	0.69	9.9	0.51	0.77	6.8	0.47	5.0	0.63	-0.09	3.1	0.83
LT00044	87	10.1	12.1	0.75	0.20	7.8	0.83	14.8	0.81	0.47	10.1	0.68	10.8	0.71	0.08	7.7	0.70
SE0001A	84	9.6	6.5	0.72	-0.33	5.8	0.63	8.5	0.71	-0.11	6.5	0.81	8.6	0.72	-0.11	6.5	0.79
SE0011R	88	5.6	5.7	0.65	0.02	4.5	0.70	7.7	0.70	0.37	6.6	0.64	7.5	0.68	0.34	6.9	0.73
SE0012R	89	4.4	3.4	0.51	-0.23	3.8	0.57	5.3	0.70	0.20	4.1	0.75	3.8	0.65	-0.14	4.0	0.73
SE0022A	85	4.3	6.0	0.59	0.38	3.8	0.73	6.5	0.62	0.50	4.3	0.66	5.2	0.67	0.21	3.6	0.82
SE0066A	84	2.7	3.4	0.55	0.23	3.1	0.64	5.1	0.63	0.88	4.4	0.29	3.5	0.55	0.29	3.5	0.60

Table S9: Spatial averages of seasonal mean concentrations of $PM_{2.5}$ (μg m^{-3}) from the "base" simulation and ship contributions to $PM_{2.5}$ levels (μg m^{-3}) for the study domain (Baltic Sea region as in Fig. 1).

Contribution	CTM	MAM	JJA	SON	DJF
All emissions	CMAQ	4.69	1.76	3.96	8.93
	SILAM	6.01	7.43	6.02	4.34
	EMEP/MSC-W	3.77	3.24	4.45	4.57
Ship emissions	CMAQ	0.51	0.30	0.19	0.28
	SILAM	0.39	0.39	0.15	0.11
	EMEP/MSC-W	0.30	0.38	0.18	0.12

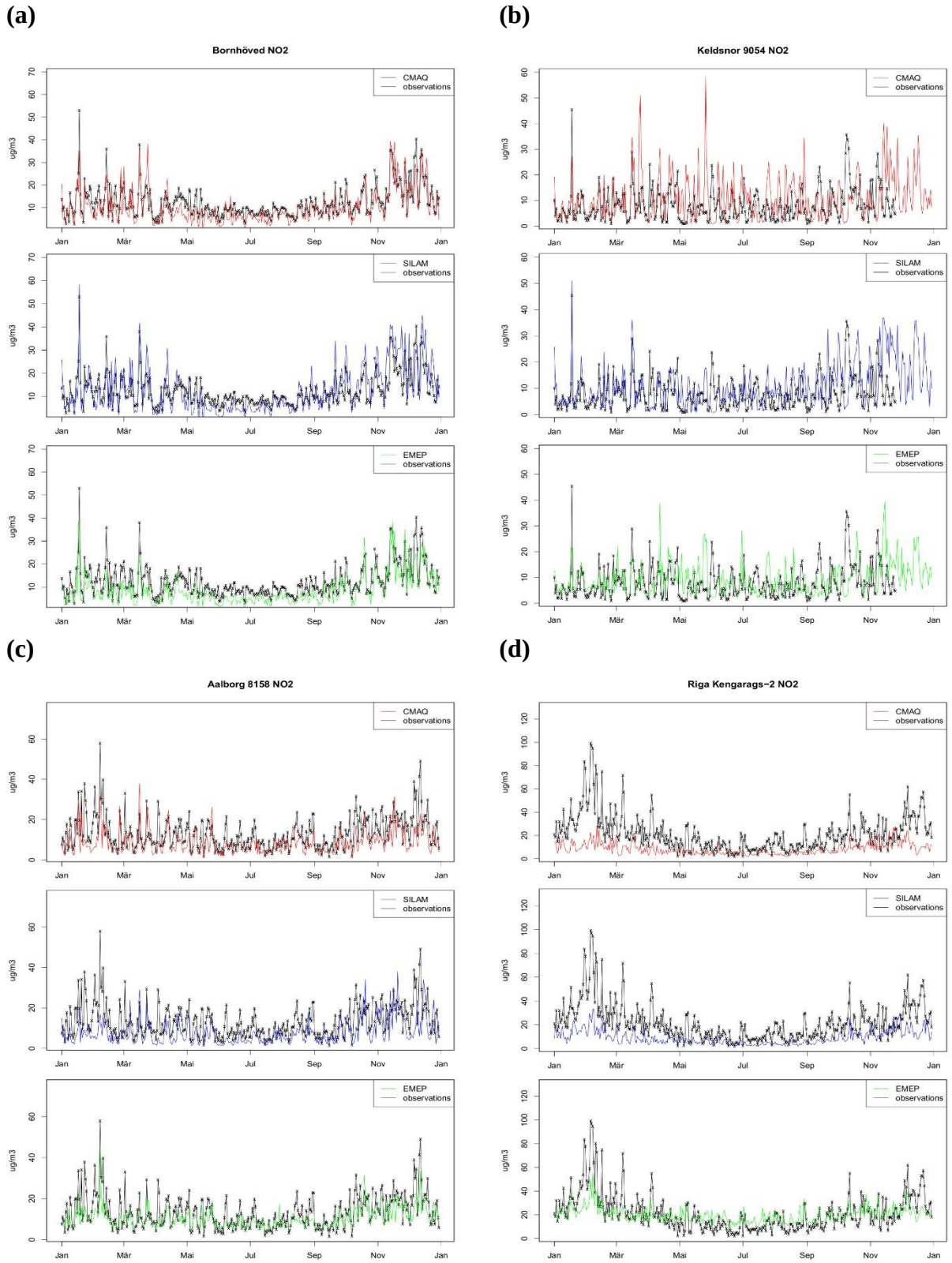

Figure S1. Time series comparison for daily mean NO_2 concentration (μg m^{-3}) at four background stations: (a) DESH008 (Bornhöved, Germany; rural), (b) DK0054A (Keldsnor/9054, Denmark; rural), (c) DK0053A (Aalborg/8158, Denmark; urban), (d) LV0RKE2 (Riga Kengarags-2, Latvia; urban). Model data from CMAQ (red line), SILAM (blue line), EMEP-MSC-W (green line), and observations (black line with asterisk).

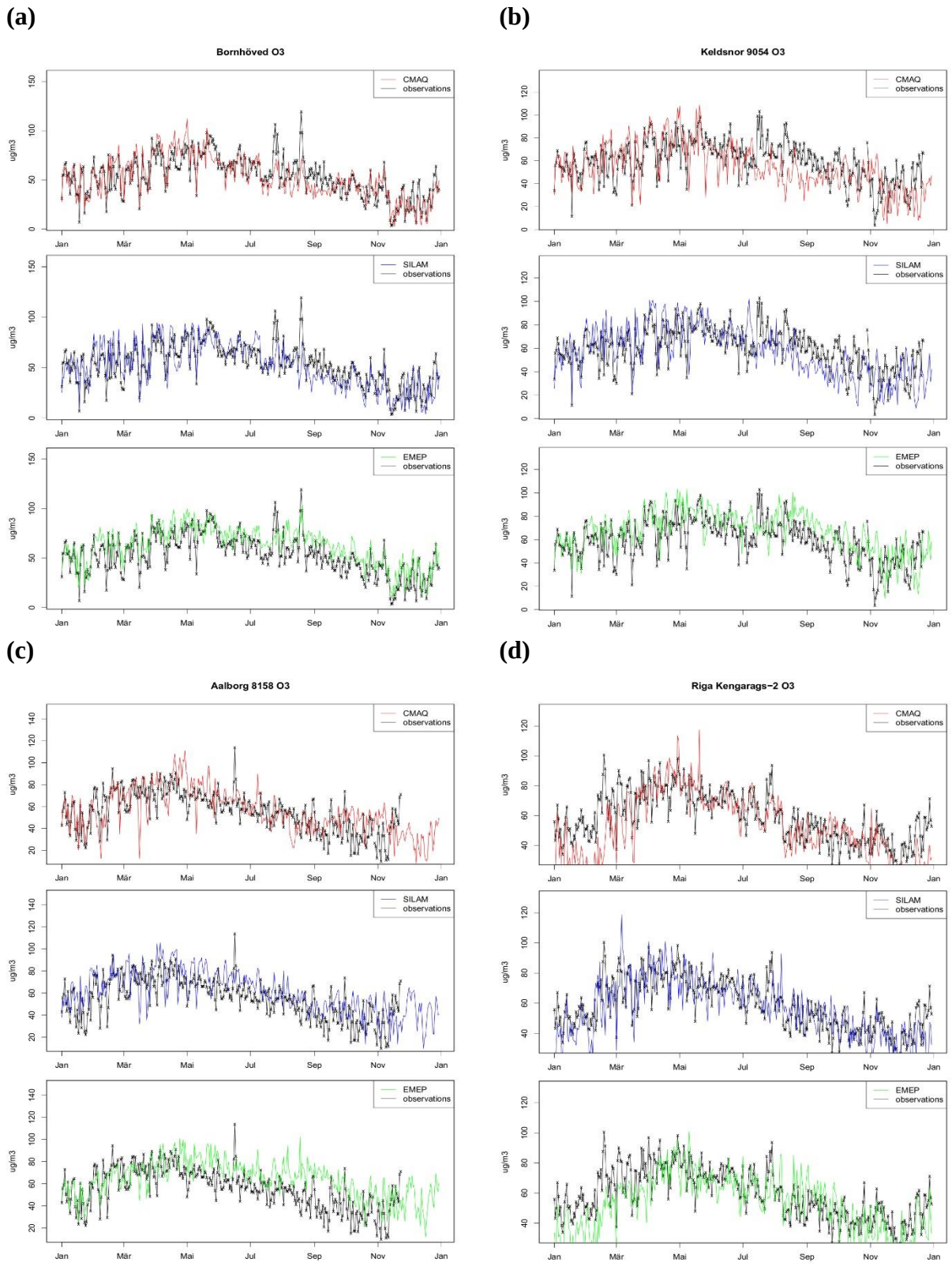

Figure S2. Time series comparison for daily mean O_3 concentration (μg m^{-3}) at four background stations: (a) DESH008 (Bornhöved, Germany; rural), (b) DK0054A (Keldsnor/9054, Denmark; rural), (c) DK0053A (Aalborg/8158, Denmark; urban), (d) LV0RKE2 (Riga Kengarags-2, Latvia; urban). Model data from CMAQ (red line), SILAM (blue line), EMEP-MSC-W (green line), and observations (black line with asterisk).

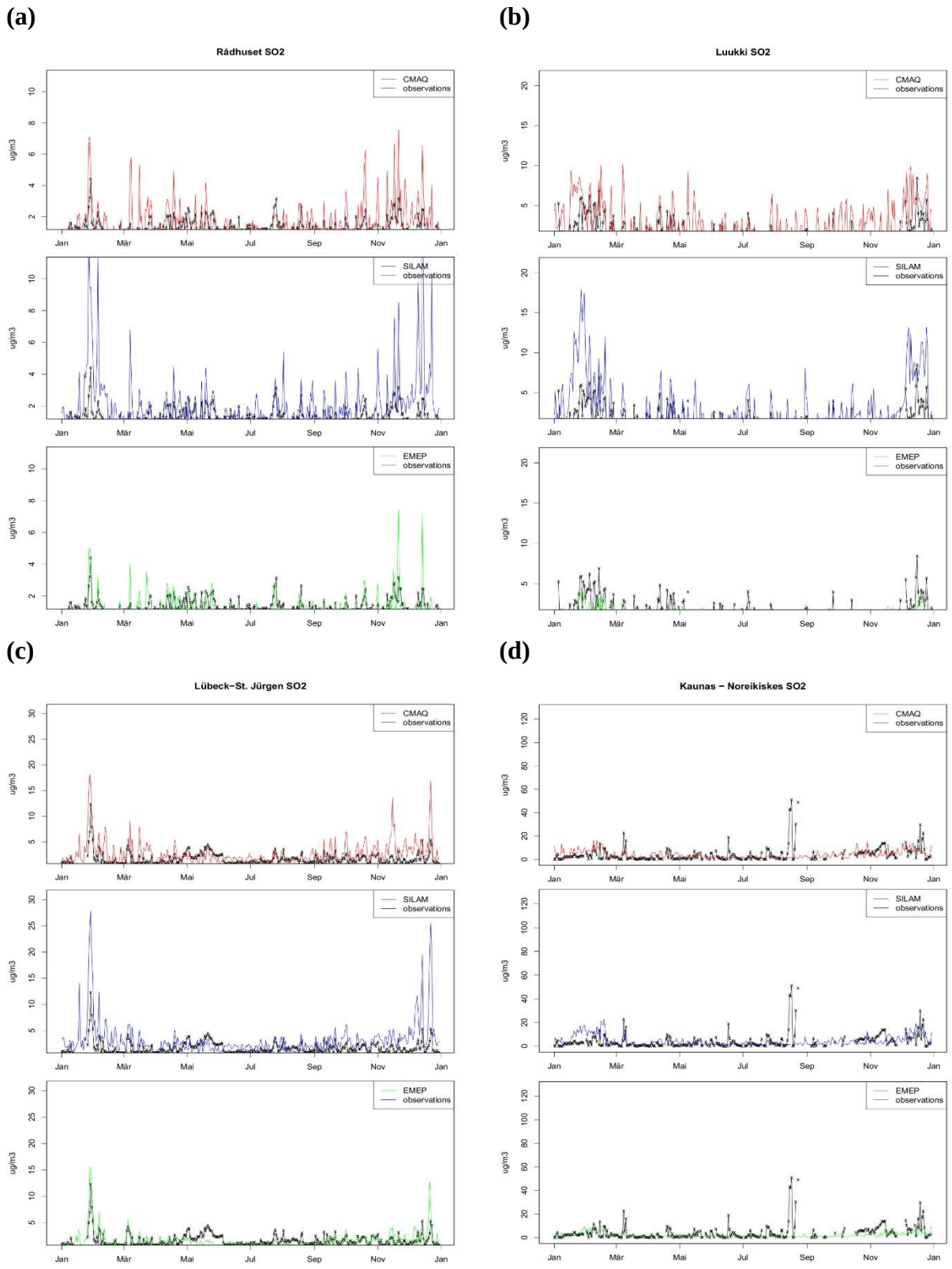

Figure S3. Time series comparison for daily mean SO_2 concentration ($\mu g\ m^{-3}$) at four background stations: (a) SE0001A (Rådhuset, Sweden; rural), (b) FI00208 (Luuki, Finland; rural), (c) DESH023 (Lübeck-St. Jürgen, Germany; urban), (d) LT00044 (Kaunas-Noreikiskes, Lithuania; urban). Model data from CMAQ (red line), SILAM (blue line), EMEP-MSC-W (green line), and observations (black line with asterisk).

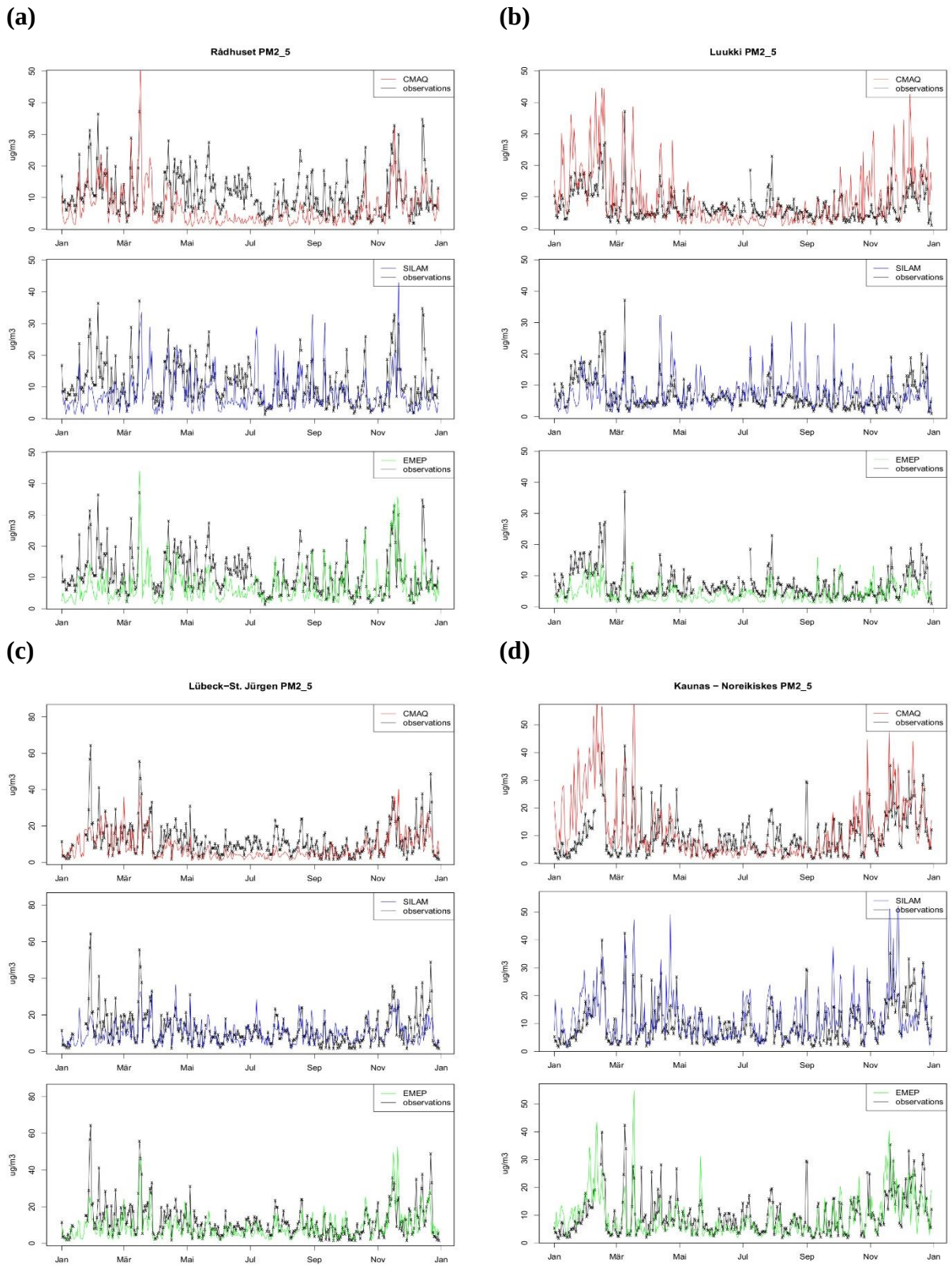

Figure S4. Time series comparison for daily mean $PM_{2.5}$ concentration ($\mu g\ m^{-3}$) at four background stations: (a) SE0001A (Rådhuset, Sweden; rural), (b) FI00208 (Luuki, Finland; rural), (c) DESH023 (Lübeck-St. Jürgen, Germany; urban), (d) LT00044 (Kaunas-Noreikiskes, Lithuania; urban). Model data from CMAQ (red line), SILAM (blue line), EMEP-MSC-W (green line), and observations (black line with asterisk).

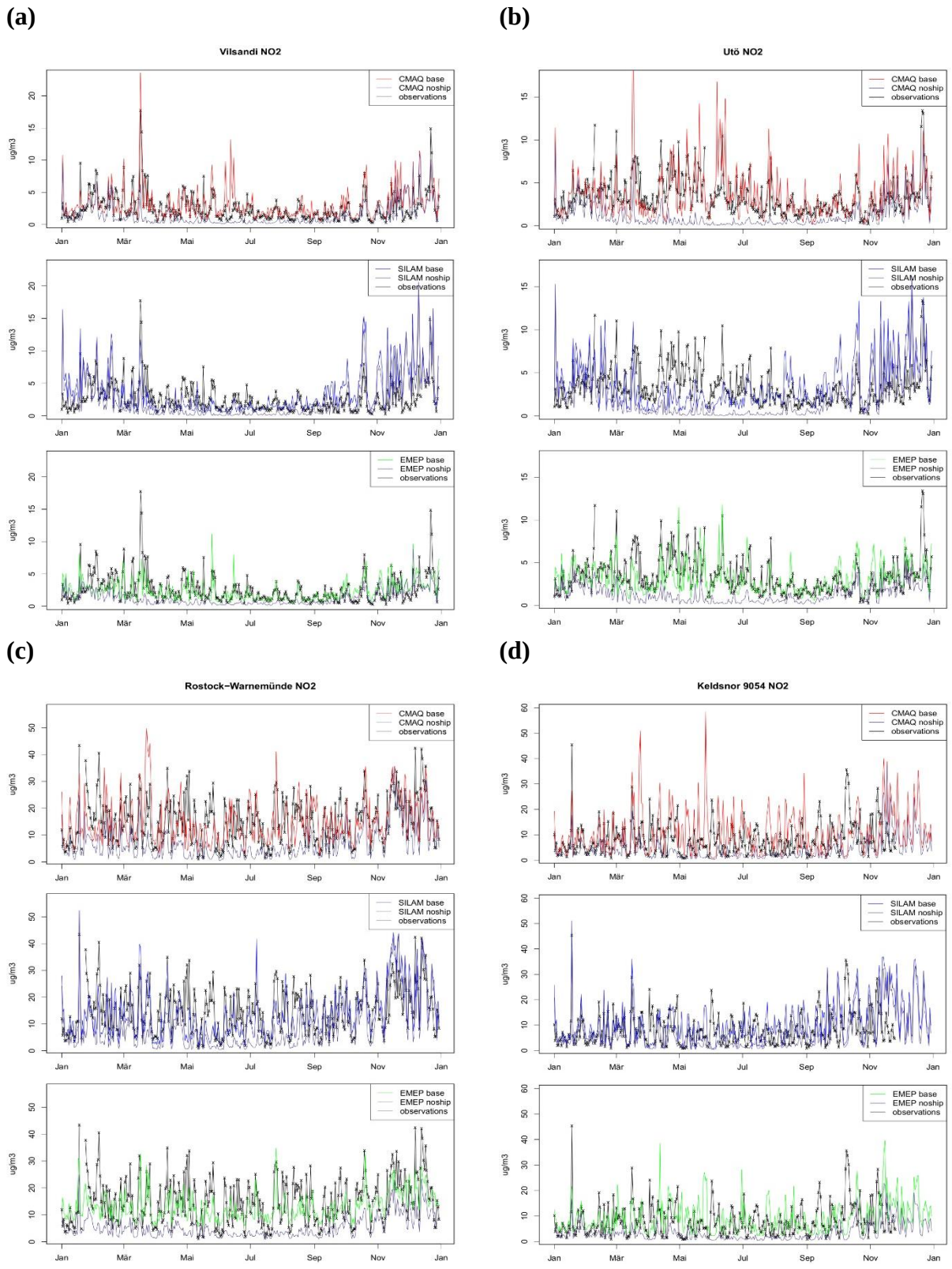

Figure S5. Ship influence on daily mean NO_2 concentration (µg m^{-3}): (a) EE0011A (Vilsandi, Estonia), (b) FI00349 (Utö, Finland), (c) DEMV021 (Rostock-Warnemünde, Germany), (d) DK0054A (Keldsnor/9054, Denmark), Model data from CMAQ (red line), SILAM (blue line), EMEP-MSC-W (green line), "noship" run (dark blue line) and observations (black line with asterisk).

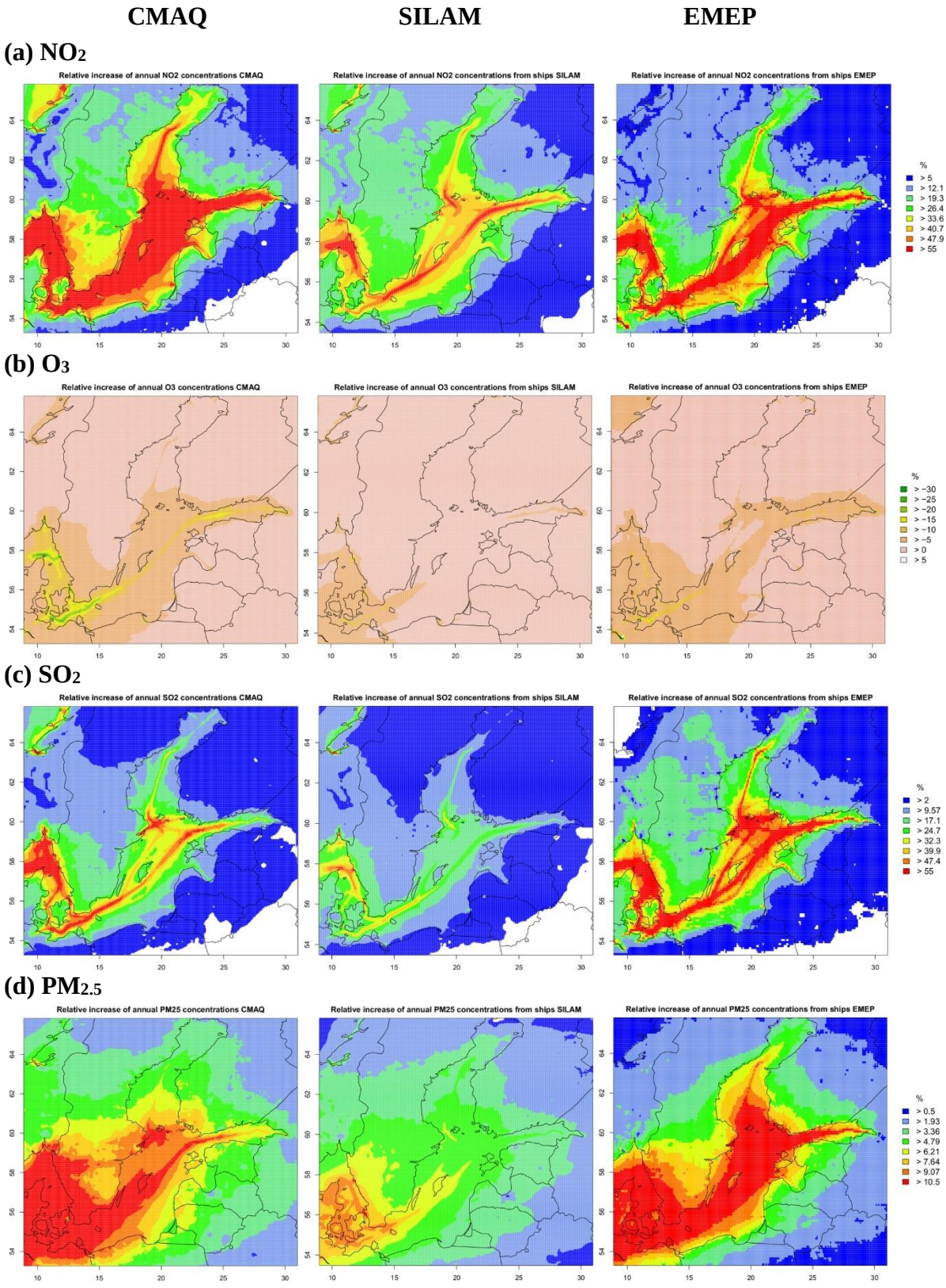

Figure S6. Comparison of the relative contribution of shipping (in percent) to the annual mean concentrations from the CMAQ (left column), SILAM (middle column) and EMEP (right column) model in the Baltic Sea region for (a) O_3, (b) NO_2, (c) SO_2, and (d) $PM_{2.5}$. Empty areas correspond to contributions between zero and the lowest value in the legend.

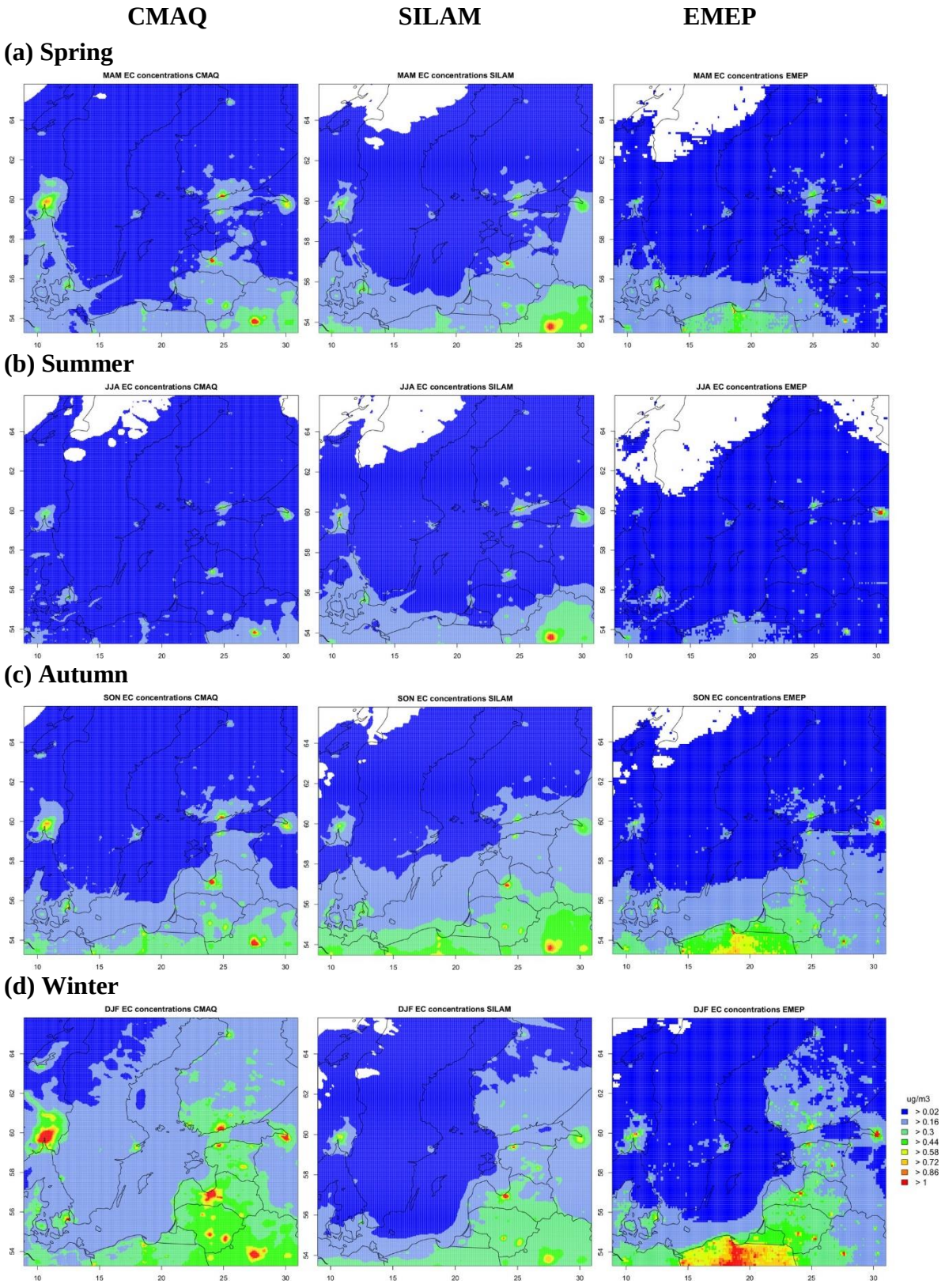

Figure S7. Comparison of the seasonal mean EC concentration (μg m^{-3}) from the CMAQ (left column), SILAM (middle column) and EMEP (right column) model in the Baltic Sea region for (a) spring, (b) summer, (c) autumn, and (d) winter. Empty areas correspond to concentrations between zero and the lowest value in the legend.

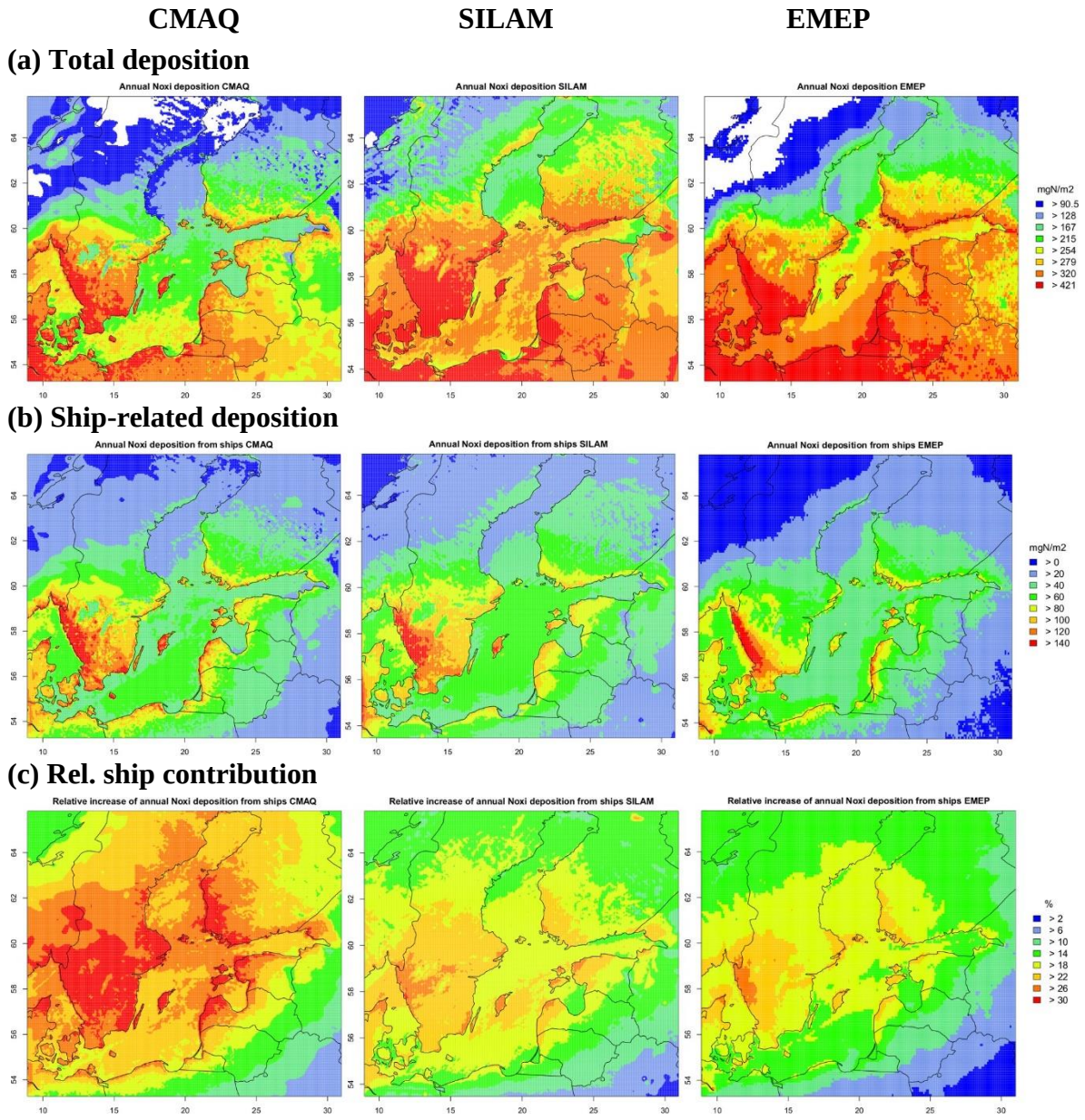

Figure S8. Comparison of the total deposition of oxidised nitrogen (N_{oxi}) from the CMAQ (left column), SILAM (middle column) and EMEP (right column) model in the Baltic Sea region for (a) the annual sum (mg(N) m^{-2}), (b) the ship-related annual sum (mg(N) m^{-2}), and (c) relative contribution of shipping in percent. Empty areas correspond to deposition amounts between zero and the lowest value in the legend.