

Figure S1. The number of hourly  $H$  values higher than 200 m,  $N$  (%), determined from the observations (white bars) and from the EMEP model (blue bars) per month during 2001 at the Cabauw tower.

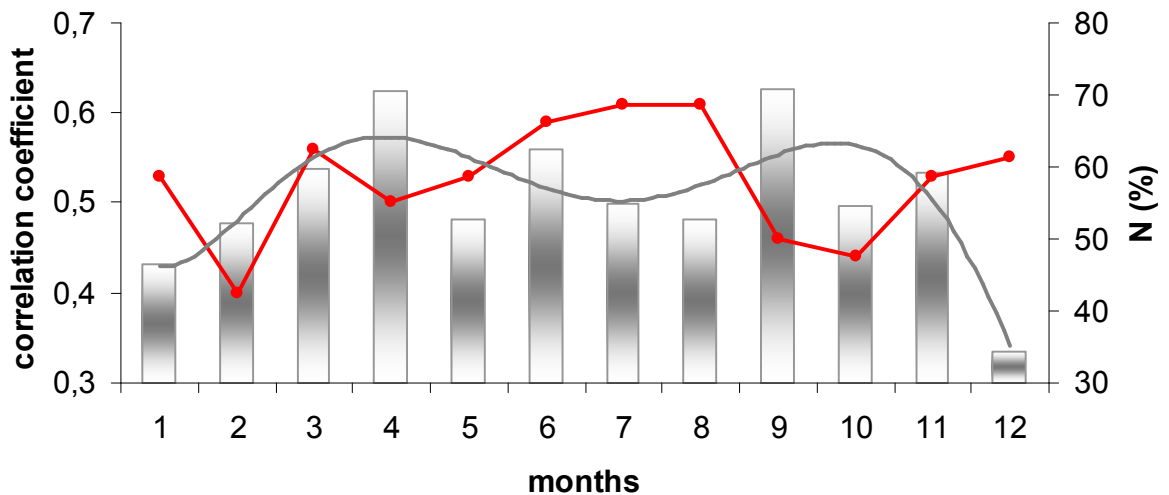


Figure S2. The number of hourly  $H > 200$  m values,  $N$  (%) determined from the observations (bars, right axes) and the corresponding monthly correlation coefficient (red line, left axes) at the Cabauw tower during the year 2001. The grey line is a trend line of  $N$ .

Table S1. Differences between the correlation coefficients,  $D(r)$ , and BIAS,  $D(\text{BIAS})$  for  $\text{NO}_2$ ,  $\text{SO}_2$  and  $\text{SO}_4^{2-}$  obtained by different parameterization schemes, the standard STD and Grisogono vertical diffusion schemes, applied in the EMEP model during the 2001 in all stability conditions. Blue cells denote better performance of the Grisogono scheme, green denote better performance of the STD scheme and yellow are cases without change.

Station	NO2		SO2		SO4	
	$D(r)$	$D(\text{BIAS})$	$D(r)$	$D(\text{BIAS})$	$D(r)$	$D(\text{BIAS})$
AT02	0.01	-4.28	0	-1.36	0	-6.14
AT04	0	12.32	0.04	0.00		
AT05	0	12.00	0	0.00		
CH01	-0.01	63.64	-0.01	37.50	0	27.27
CH02	0.03	-3.12	-0.01	-2.22	0	-5.48
CH04	0.04	-5.68	-0.01	-1.89		
CH05	-0.01	-6.27	0.01	8.82	0.03	-5.08
CZ01	-0.01	0.84	0	1.82	0.02	-5.51
CZ03	0	-3.66	0.02	-1.64	0.01	-4.31
DE01	0.05	10.78	0.05	-10.53	0	-5.05
DE02	0.05	-8.12	-0.01	-2.08	0.04	-4.76
DE03			0.03	-2.56	0.02	-4.30
DE04	0.02	3.26	0.03	-2.06		
DE05			0.03	-2.67		
DE07	0.03	-3.21	0.02	0.00	-0.01	-3.77
DE08	-0.01	-0.61	0.05	1.96		
DE09	-0.04	1.09	0	-2.20	-0.01	-2.75
DK03	-0.04	-38.67	-0.02	-8.33	0.01	-1.30
DK05			0	46.77	0	-4.88
DK08			0.1	-57.14	0.02	3.75
EE09	-0.02	-8.33	-0.02	-1.56		
EE11	-0.08	-14.46	0.12	-9.38		
FI09			0	-4.35	0.01	1.64
FI17			0.02	6.74	-0.01	-2.74
FI37			0	-2.94	0.01	0.00
FR03			0	0.00	0.03	-6.45
FR05			0.02	-3.26	-0.01	-5.80
FR08			0.01	-1.75	0.02	8.51
FR09			0.02	-2.53	-0.02	-4.05
FR10			0	0.00	0.02	8.16
FR12			0.06	6.15	0	6.56
FR13			0	-1.54	0.02	-6.90
FR14			0.03	-2.70	0.03	10.00
GB02			-0.09	-2.63	0.01	-2.08
GB04			0.04	4.46	0	-4.17
GB06			-0.01	0.00	0.01	0.00
GB07			-0.01	-11.01	-0.02	-5.00
GB13			0.02	2.41	-0.01	-1.45
GB14			-0.01	4.82	-0.02	-3.17
GB15			-0.03	0.00	-0.02	3.33
GB16			-0.04	-2.30	0	0.00
HU02	0	9.20	-0.01	-2.30	-0.04	-6.88
IE01	0.07	0.00	0.03	3.13	0.02	0.00
IE02			0.03	0.00	0	3.33

IT01	-0.01	-13.21	0.02	6.94	0.03	-5.94
IT04	-0.04	-17.48	-0.01	16.39	0.02	-7.44
LT15	0.03	3.39	0.01	-1.23		
LV10	0.02	8.00	0	2.44	-0.01	12.00
LV16	0.04	7.46	0.01	0.00	0	10.53
NL09	0.04	8.89	0	-6.56	0	-1.35
NL10	0.11	-1.04	0.01	-2.29	-0.01	-2.02
NO01	-0.03	-16.67	0.04	-6.25	-0.01	-2.27
NO08	-0.07	-16.67	0.01	0.00	-0.01	-2.86
NO15	0.06	12.50	0	0.00	0	0.00
NO39	0.01	-5.26	0.02	0.00	0.01	-6.25
PL02	0.02	-1.82	0.01	-1.84	0.01	-2.72
PL04	0.05	6.57	0.02	-0.67	0.02	-1.88
PL05	0.02	-6.06	0	4.92	0.01	-4.55
SE02	-0.12	62.59	-0.03	156.52	-0.02	-11.39
SE05	0.04	-14.29	0.01	8.33	0	0.00
SE08	-0.05	2.15	0.02	-5.08	0.01	0.00
SE11	0	-2.17	-0.01	0.00	0	-2.67
SI08			0.01	-1.49	0	6.98
SK02	-0.03	0.00	0.01	0.00	0.08	12.24
SK04	0	-0.53	0.02	0.90	0.06	6.00
SK05	0.01	-1.52	0	0.92	0.01	4.84
SK06	0.01	-1.40	0.02	0.00	0.02	6.12
SK07	0.02	-1.42	0.02	0.00	0	-5.77