

Table S1 Coefficients for dark aging experiments. Lhs is the variable of change, which rhs (single or interaction variable) explains. Est is the estimated coefficient.

lhs	op	rhs	est
AccM	~	AccM	-0,0027
AccM	~	AccM*AitM	1,26E-08
AccM	~	AccM*CoarseM	-1,2E-08
AitM	~	AitM	-0,01242
AitM	~	AccM	0,001417
AitM	~	CoarseM*AitM	-4,1E-08
AitM	~	AitM*AccM	5,8E-09
CoarseM	~	CoarseM	-0,00573
CoarseM	~	AitM*AccM	2,99E-09
CoarseM	~	AccM*CoarseM	2,94E-09
CoarseM	~	NuclM*CoarseM	-2E-09
CoarseM	~	AitM*CoarseM	3,71E-10
NO2	~	NO2	-0,05153
NO2	~	O3*NO2	-0,00078
NO2	~	PTR3*O3	0,00026
NO2	~	PTR3*NO2	0,00014
NO3	~	NO3	0,06563
NO3	~	POA2	0,023055
NO3	~	POA2*NO3	-0,00673
NO3	~	SOA2	0,004653
NO3	~	SOA2*NO3	-0,00226
NO3	~	NO3*POA1	-0,00212
NO3	~	POA1	0,000713
NO3	~	POA1*SOA2	0,000185
NO3	~	POA2*SOA2	-4,2E-07
NuclM	~	NuclM	0,019652
NuclM	~	AitM	0,00214
NuclM	~	NuclM*CoarseM	-9,5E-08
NuclM	~	AitM*NuclM	-7,6E-08
O3	~	O3	0,006642
O3	~	NO2*O3	0,005407
O3	~	O3*PTR3	-0,00249
O3	~	O3*PTR2	-0,00066
O3	~	NO2*PTR3	0,000569
POA1	~	POA1	0,032737

POA1	~	SOA1*POA1	0,001143
POA1	~	NO2*POA1	-0,00062
POA2	~	POA2	0,057714
POA2	~	NO3*POA2	0,012755
POA2	~	O3*POA2	0,005531
POA2	~	NO2*POA2	-0,00515
PTR1	~	PTR1*O3	-0,00111
PTR1	~	PTR2*O3	0,000436
PTR1	~	PTR1*PTR2	0,000213
PTR1	~	PTR3*PTR1	-7,7E-05
PTR1	~	PTR3*O3	7,22E-05
PTR1	~	PTR1	-6,7E-06
PTR2	~	PTR2	0,00387
PTR2	~	O3	0,000744
PTR2	~	O3*PTR2	-0,00013
PTR2	~	PTR1*PTR2	-1,7E-05
PTR3	~	PTR2	0,012632
PTR3	~	PTR3	-0,00037
PTR3	~	PTR3*PTR2	-3,8E-05
SOA1	~	SOA1	0,035157
SOA1	~	NO3*SOA1	0,009393
SOA1	~	SOA2*SOA1	-0,00405
SOA1	~	O3*SOA1	-0,00164
SOA1	~	PTR2*SOA1	0,000556
SOA1	~	O3*PTR2	5,62E-05
SOA2	~	SOA2	-0,06182
SOA2	~	SOA2*O3	-0,0035
SOA2	~	NO2*SOA2	0,002146
SOA2	~	NO2*O3	0,000308
SOA3	~	SOA3	-0,04972
SOA3	~	SOA3*O3	0,002158
SOA3	~	NO3	0,001454
SOA3	~	NO3*SOA3	-0,00029

Table S2 Coefficients for photochemical aging experiments. Lhs is the variable of change, which RhS (single or interaction variable) explains. Est is the estimated coefficient.

lhs	op	rhs	est
AccM	~	CoarseM	0,216403
AccM	~	AccM	-0,04771
AccM	~	AitM	5,48E-05
AccM	~	NuclM*AitM	2,29E-07
AccM	~	NuclM*AccM	-2,1E-07
AccM	~	CoarseM*AccM	-9,3E-08
AccM	~	AitM*AccM	9,21E-08
AitM	~	AitM	-0,01235
AitM	~	NuclM	0,012287
AitM	~	AitM*NuclM	-5,3E-09
CoarseM	~	CoarseM	-0,00544
CoarseM	~	AitM*CoarseM	2,06E-08
CoarseM	~	NuclM*CoarseM	-1,8E-08
CoarseM	~	NuclM*AitM	1,87E-09
NO	~	NO	-0,01987
NO	~	OH	2,26E-07
NO	~	NO*OH	-1,6E-08
NO2	~	NO2	0,015574
NO2	~	O3*NO2	-0,00036
NO2	~	OH*O3	6,25E-09
NO2	~	OH*NO2	-4E-09
NO3	~	O3	0,002306
NO3	~	NO3	-0,00155
NO3	~	O3*NO3	-0,00044
NO3	~	OH*NO3	4,23E-10
NO3	~	OH*O3	5,68E-11
NuclM	~	NuclM	-0,01944
NuclM	~	CoarseM	0,002839
NuclM	~	CoarseM*NuclM	-6,2E-08
O3	~	PTR1	0,096874
O3	~	O3	-0,01493
O3	~	PTR1*O3	0,000421
O3	~	OH	1,08E-07
O3	~	OH*O3	-7,4E-09

O3	~	OH*PTR1	6,92E-09
OH	~	PTR3	348,7825
OH	~	PTR3*PTR1	28,8726
OH	~	PTR3*PTR2	4,109286
OH	~	OH	0,030327
OH	~	PTR1*OH	0,003878
OH	~	PTR2*OH	-0,00094
OH	~	PTR3*OH	-0,00055
POA1	~	POA1*NO3	-0,01475
POA1	~	POA1*PTR1	0,007048
POA1	~	POA1	-0,00475
POA1	~	OH*POA1	-1,4E-08
POA1	~	OH*PTR1	2,47E-09
POA2	~	NO3	0,013737
POA2	~	POA2	-0,0091
POA2	~	POA2*POA1	-0,0091
POA2	~	NO3*POA2	0,001712
POA2	~	POA2*OH	-2E-09
PTR1	~	PTR1	0,053336
PTR1	~	PTR1*O3	-0,00189
PTR1	~	PTR2*PTR1	0,000357
PTR1	~	PTR2*O3	0,000121
PTR1	~	PTR2	-8E-05
PTR1	~	OH	3,43E-08
PTR1	~	PTR1*OH	-6E-09
PTR2	~	PTR2	-0,01851
PTR2	~	O3	0,003119
PTR2	~	O3*PTR2	0,000178
PTR2	~	OH	2,64E-08
PTR2	~	OH*PTR2	9,9E-10
PTR2	~	OH*O3	9,25E-10
PTR3	~	O3	0,086921
PTR3	~	PTR3	0,010661
PTR3	~	O3*PTR3	-0,00058
PTR3	~	PTR3*OH	-7,3E-10
SOA1	~	SOA2*SOA1	-0,0078
SOA1	~	PTR1*SOA1	0,003405
SOA1	~	O3*SOA1	-0,00149
SOA1	~	O3*PTR1	0,000707

SOA1	~	SOA1*OH	2,9E-09
SOA1	~	SOA2*OH	7,59E-10
SOA2	~	SOA2	0,054026
SOA2	~	O3*SOA2	-0,00138
SOA2	~	PTR2*SOA2	-0,00042
SOA2	~	OH	4,18E-08
SOA2	~	SOA2*OH	-3,3E-09
SOA3	~	NO3*SOA3	-0,03585
SOA3	~	O3	0,027487
SOA3	~	PTR1*SOA3	0,01178
SOA3	~	O3*SOA3	-0,00026
SOA3	~	PTR1*O3	-3,2E-05
SOA3	~	SOA3*OH	2,31E-09

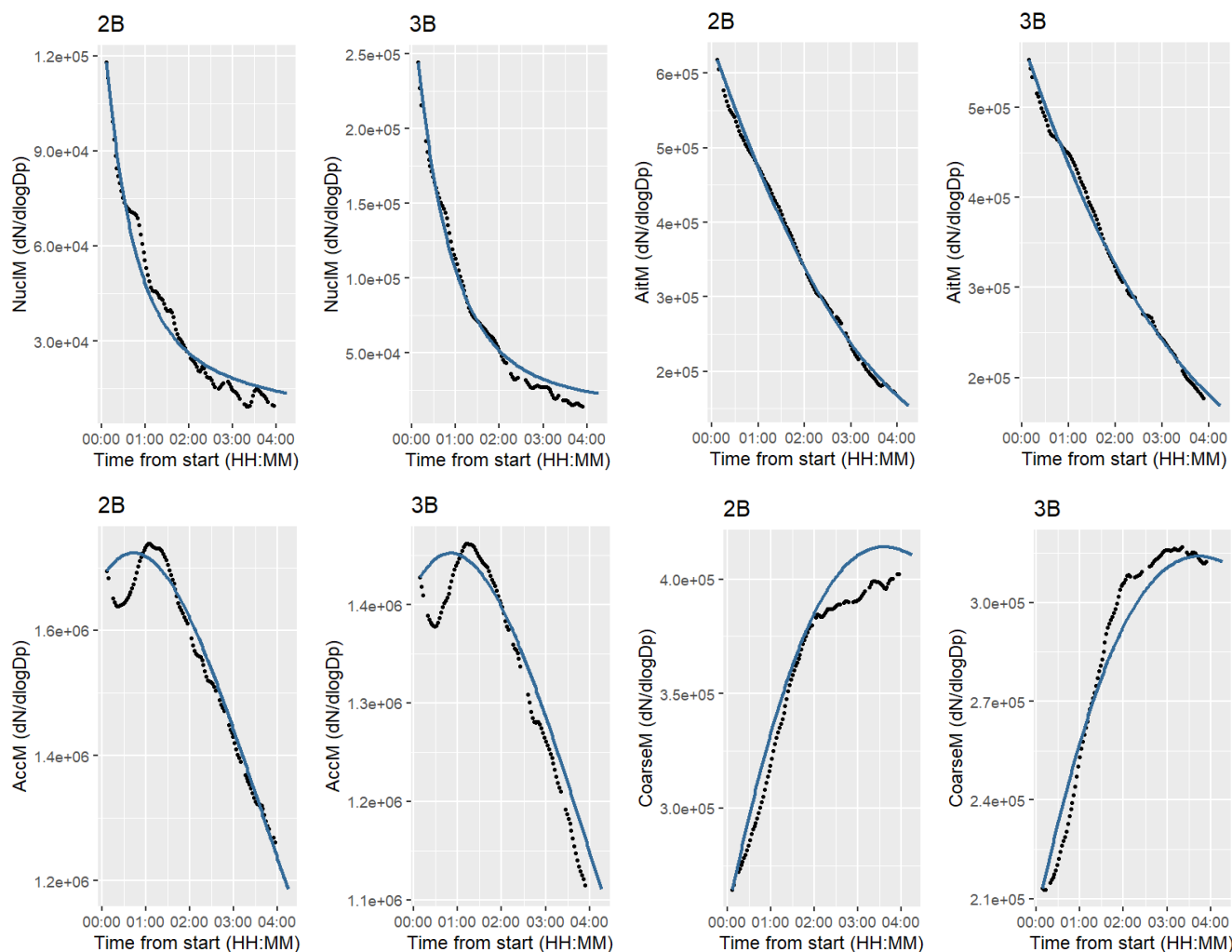


Figure S1 Evolution of size distribution variables (Nucleation mode, Aitken mode, Accumulation mode, and coarse mode) in dark aging experiments. Black points represent the filtered version of variable, and blue line is the modelled evolution.

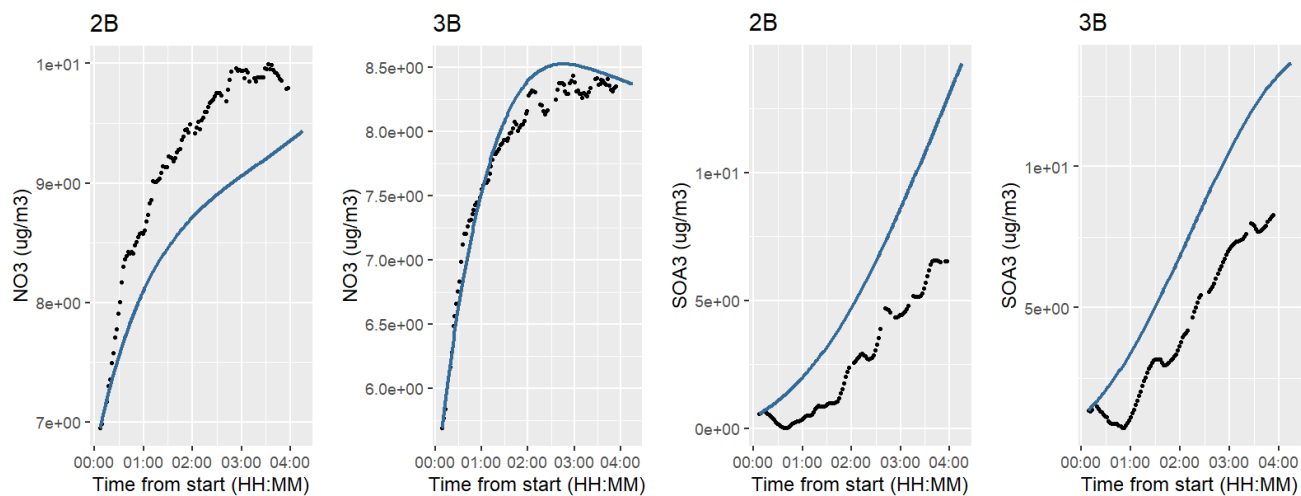
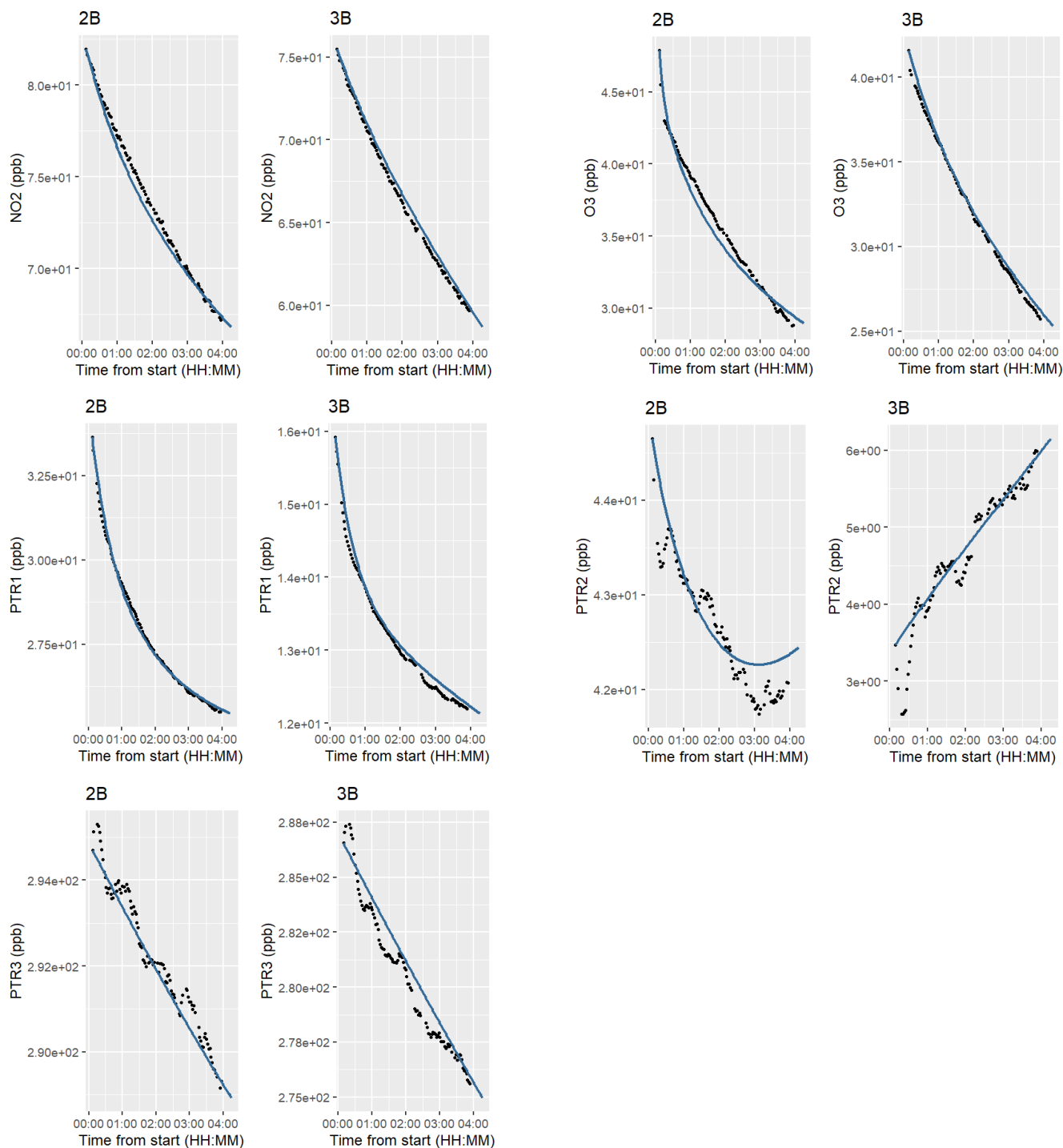


Figure S2 Evolution of particle chemical composition variables (NO₃ and SOA₃) in dark aging experiments. Black points represent the filtered version of variable, and blue line is the modelled evolution.



5 **Figure S3 Evolution of gas variables (NO₂, O₃, and PTR factors) in dark aging experiments. Black points represent the filtered version of variable, and blue line is the modelled evolution.**

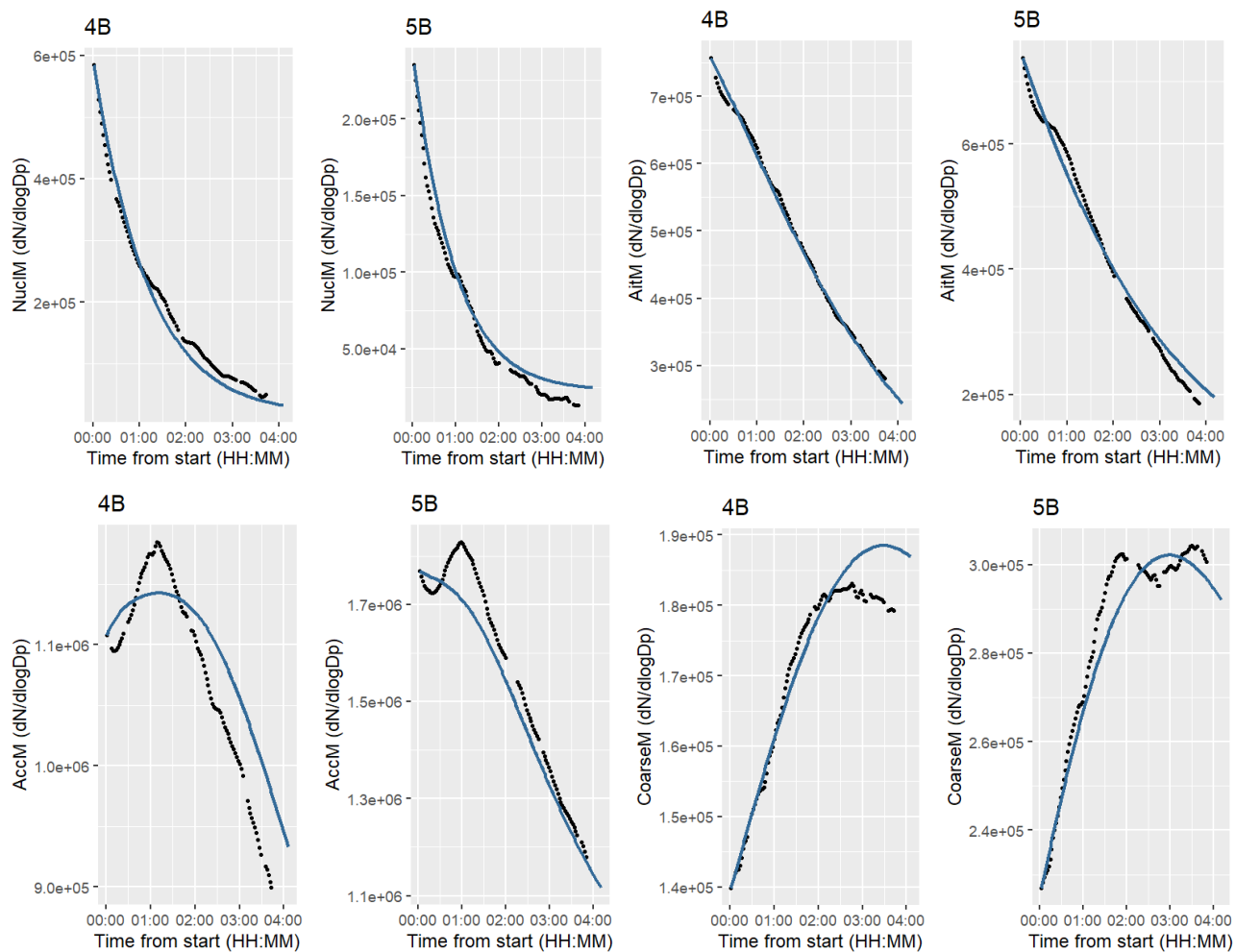


Figure S4 Evolution of size distribution variables (Nucleation mode, Aitken mode, Accumulation mode, and coarse mode) in photochemical aging experiments. Black points represent the filtered version of variable, and blue line is the modelled evolution.

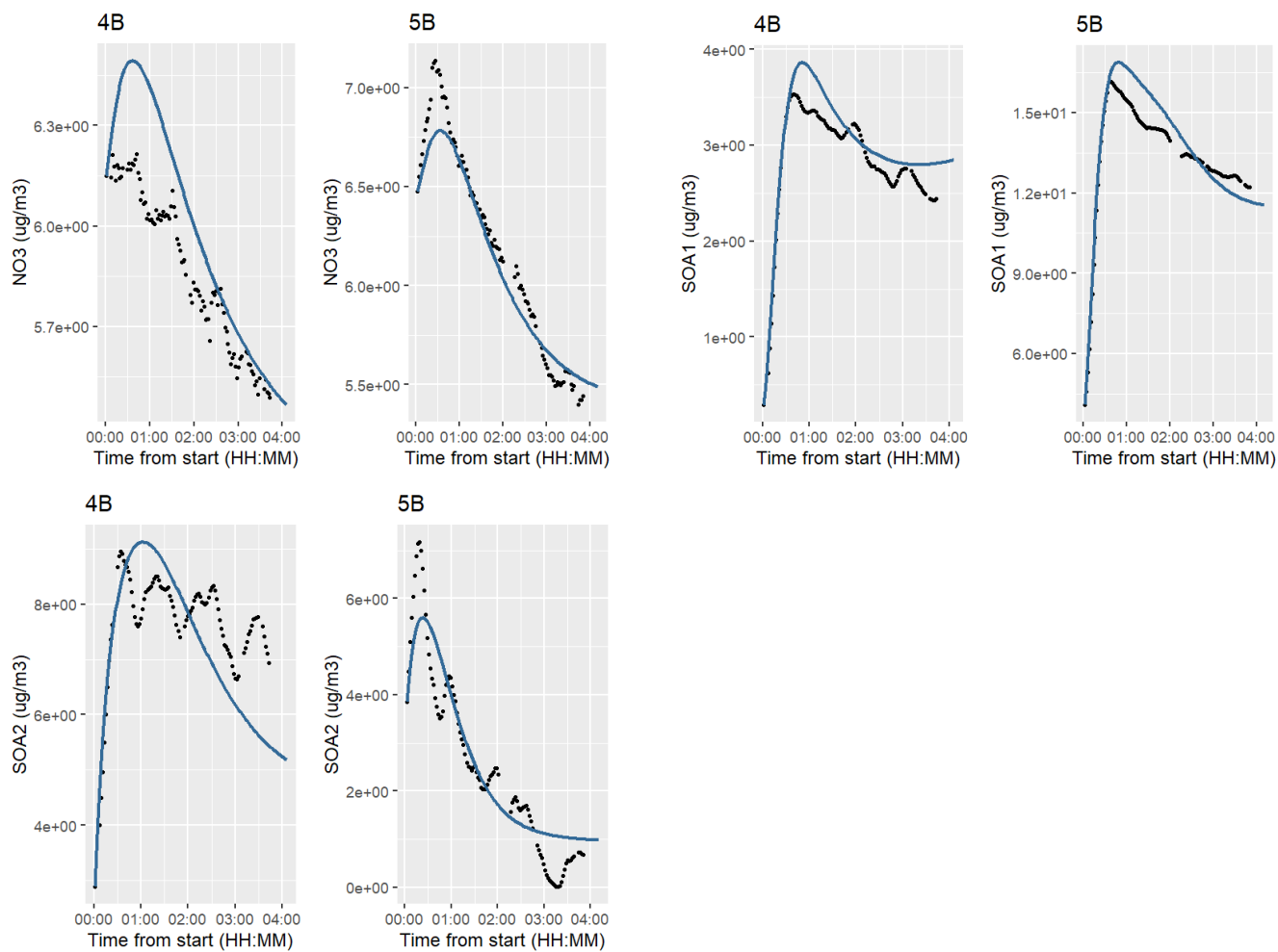
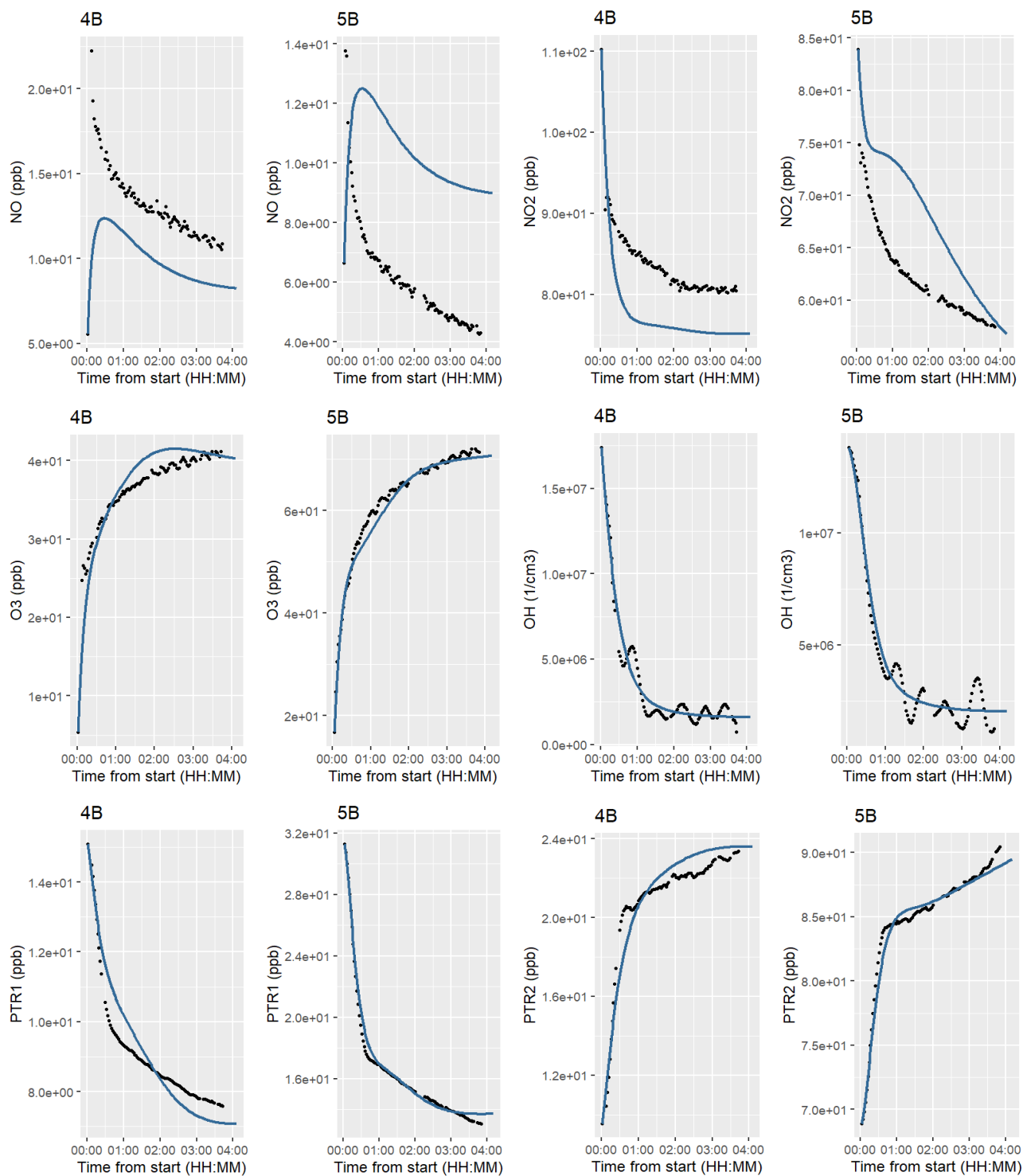


Figure S5 Evolution of particle chemical composition variables (NO₃, SOA₁, and SOA₂) in photochemical aging experiments. Black points represent the filtered version of variable, and blue line is the modelled evolution.



5 **Figure S6 Evolution of gas variables (NO, NO₂, O₃, OH, PTR1, and PTR2) in photochemical aging experiments. Black points represent the filtered version of variable, and blue line is the modelled evolution.**