Supplementary Information

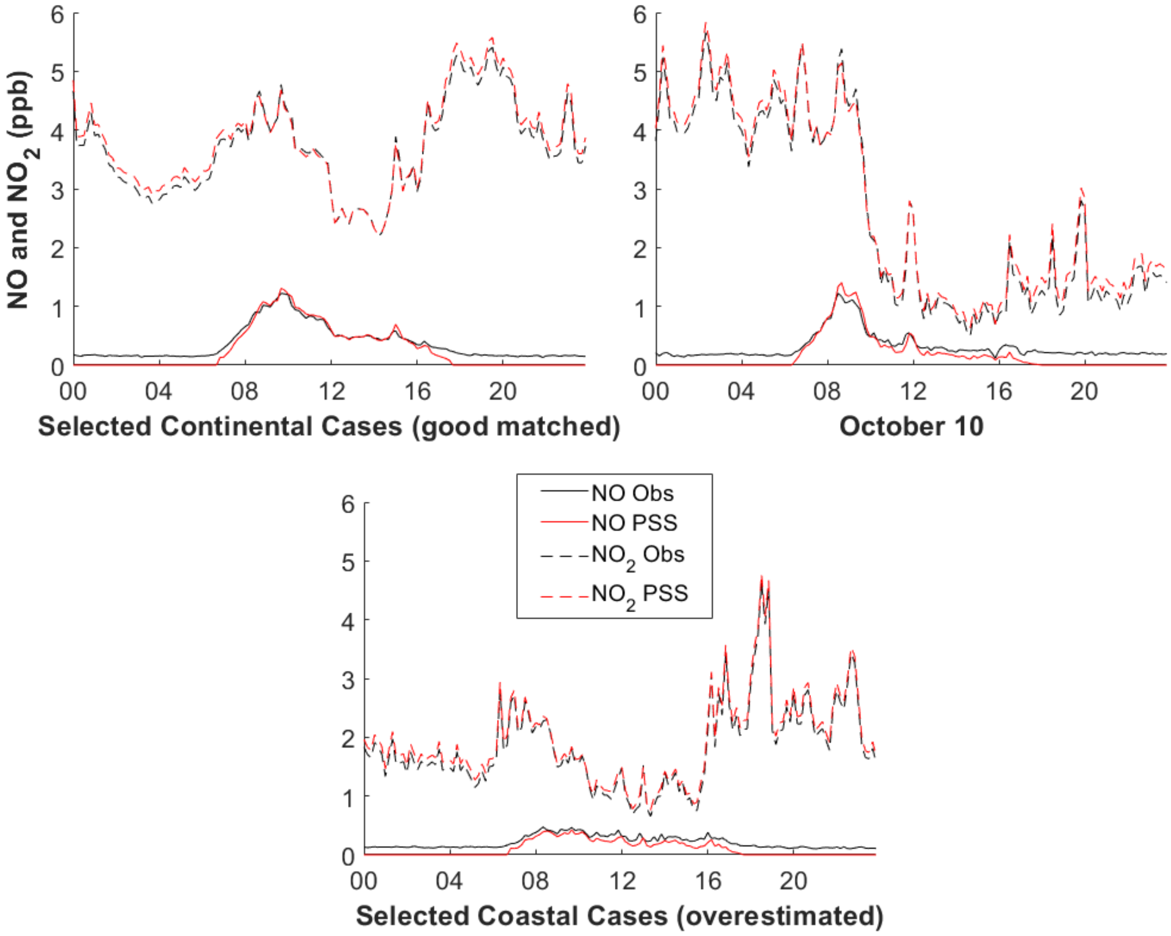

Figure S1. Comparison of observed (Obs) and pseudo-steady state (PSS) calculated NO and NO_2 concentrations for continental and coastal average diurnal concentrations and diurnal concentrations on 10 October.

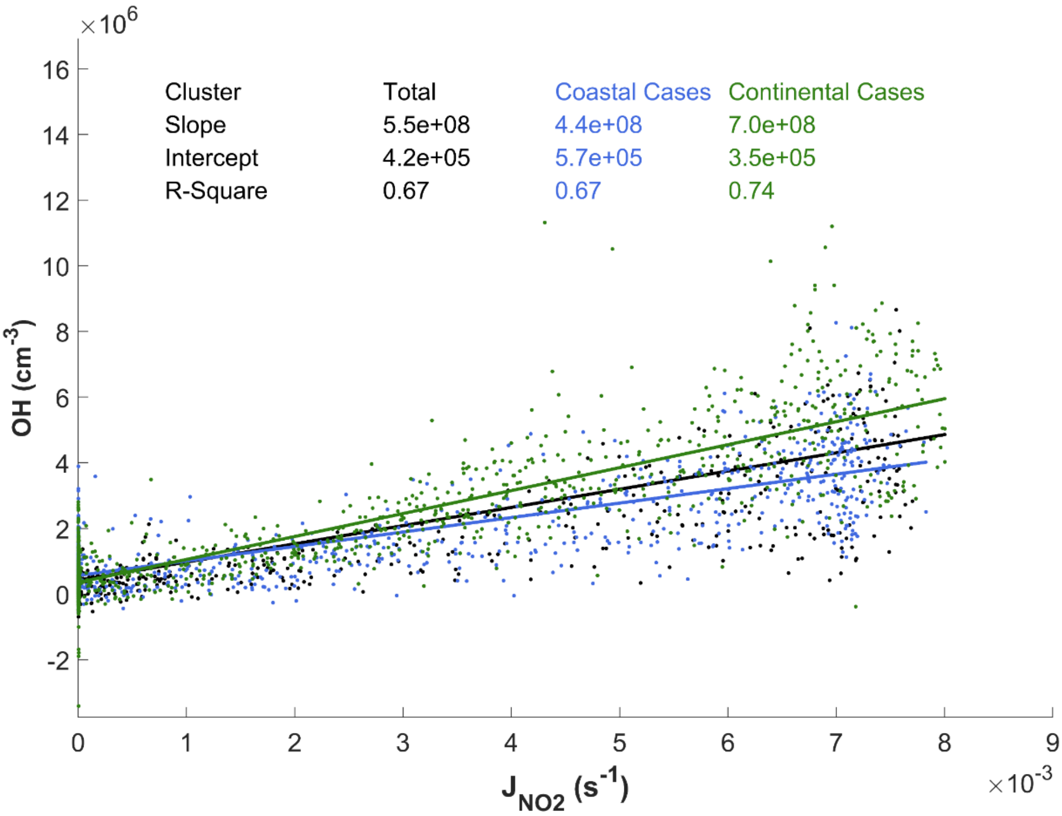

Figure S2. Correlation between photolysis frequency of NO_2 (J_{NO2}) and OH concentration. The linear regressions with respect to total, coastal, and continental cases are labelled in black, blue, and green. Note that the coastal and continental cases are reported as correlations for all cases in different clusters, not only the selected cases in the Figure 8 comparison.

Table S1. Average concentration of MCM box model input with respect to different cases

Species	Whole period	Coastal cases	Continental cases	10 October (morning)	10 October (afternoon)	Episode period
OH 10^6 (cm^{-3})	2.4 ± 1.9	2.5 ± 1.4	3.1 ± 1.7	3.7 ± 2.1	1.8 ± 1.5	4.2 ± 2.8
OH_DL 10^6 (cm^{-3})	1.0 ± 0.5	0.8 ± 0.3	0.9 ± 0.3	1.2 ± 0.5	1.5 ± 0.7	1.0 ± 0.5
OH_Err 10^6 (cm^{-3})	1.5 ± 1.0	1.8 ± 0.5	1.7 ± 0.6	0.9 ± 0.8	1.0 ± 0.9	2.5 ± 1.7
PM_Num 10^3 ($\#/cm^3$)	3.8 ± 1.9	4.1 ± 1.7	4.9 ± 1.4	NaN	NaN	5.6 ± 2.0
PM_Sur 10^7 (nm^2/cm^3)	19.7 ± 9.0	15.0 ± 2.3	26.8 ± 4.3	NaN	NaN	31.5 ± 14.2
PM_Vol 10^9 (nm^3/cm^3)	7.6 ± 3.8	4.9 ± 0.7	10.5 ± 1.5	NaN	NaN	12.0 ± 5.9
RH (%)	70.1 ± 10.1	69.9 ± 4.5	64.2 ± 2.8	69.3 ± 4.6	63.7 ± 3.7	61.6 ± 9.6
WindDi (°)	45.9 ± 35.7	49.3 ± 0.9	53.3 ± 24.0	30.7 ± 5.5	48.5 ± 3.3	125.7 ± 90.1
WindSp (m/s)	4.3 ± 1.6	5.2 ± 0.9	3.9 ± 0.6	4.0 ± 0.5	3.0 ± 0.5	2.4 ± 1.5
Temp (°C)	23.3 ± 3.5	24.7 ± 0.9	25.5 ± 1.4	25.3 ± 1.6	27.4 ± 0.9	26.7 ± 2.1
SO2	2.6 ± 1.2	3.2 ± 0.2	3.4 ± 0.1	3.5 ± 0.2	3.2 ± 0.1	4.4 ± 0.8
CO	304.9 ± 72	217.4 ± 10.9	318.0 ± 8.5	291.3 ± 16.3	258.4 ± 14.1	329.0 ± 74.6
NH3	8.8 ± 1.8	8.9 ± 0.4	9.5 ± 0.6	9.7 ± 0.2	9.2 ± 0.6	10.6 ± 3.0
NO	0.9 ± 1.4	0.3 ± 0.1	0.7 ± 0.4	0.6 ± 0.3	0.3 ± 0.1	1.4 ± 1.3
NO2	3.9 ± 3.5	1.6 ± 0.7	4.5 ± 1.1	3.4 ± 1.4	1.1 ± 0.5	10.1 ± 5.6
NOx	4.8 ± 4.4	1.9 ± 0.7	5.2 ± 1.2	4.0 ± 1.6	1.4 ± 0.5	11.4 ± 6.2
O3	49.9 ± 20.6	59.5 ± 10.1	54.7 ± 14.5	44.2 ± 9.9	61.2 ± 3.8	70.4 ± 33.5
JNO2 10^{-3} (s^{-1})	3.6 ± 2.5	4.7 ± 2.4	4.0 ± 2.0	4.8 ± 2.5	5.0 ± 2.6	4.3 ± 2.2
HONO	0.15 ± 0.069	0.15 ± 0.019	0.16 ± 0.035	0.29 ± 0.101	0.14 ± 0.015	NaN
C2H4	1.4 ± 1.3	0.5 ± 0.1	0.7 ± 0.1	0.6 ± 0.1	0.3 ± 0.1	0.9 ± 0.2
C2H6	1.9 ± 0.9	1.4 ± 0.1	2.1 ± 0.1	2.0 ± 0.1	1.7 ± 0.1	2.3 ± 0.5
C3H8	1.7 ± 0.9	1.1 ± 0.2	1.5 ± 0.2	1.3 ± 0.1	0.8 ± 0.1	2.1 ± 1.7
C3H6	0.10 ± 0.05	0.07 ± 0.01	0.11 ± 0.02	0.18 ± 0.06	0.06 ± 0.01	0.12 ± 0.04
C2H2	1.63 ± 0.65	0.97 ± 0.03	1.42 ± 0.23	1.07 ± 0.08	NaN	1.39 ± 0.48
IC4H10	0.55 ± 0.44	0.22 ± 0.04	0.61 ± 0.14	0.44 ± 0.09	0.23 ± 0.07	1.02 ± 1.04
NC4H10	0.76 ± 0.60	0.27 ± 0.06	0.88 ± 0.19	0.67 ± 0.13	0.32 ± 0.08	1.53 ± 1.62
TBUT2ENE	0.06 ± 0.01	0.05 ± 0.00	0.06 ± 0.00	0.05 ± 0.00	NaN	0.06 ± 0.01
BUT1ENE	0.08 ± 0.03	NaN	0.10 ± 0.01	0.08 ± 0.01	NaN	NaN
IC5H12	0.40 ± 0.22	0.18 ± 0.04	0.42 ± 0.05	0.46 ± 0.03	0.28 ± 0.11	0.60 ± 0.36
NC5H12	0.24 ± 0.12	0.13 ± 0.02	0.24 ± 0.02	0.33 ± 0.05	0.17 ± 0.04	0.29 ± 0.21
C4H6	0.06 ± 0.01	NaN	0.06 ± 0.00	NaN	NaN	0.06 ± 0.00

Table S1. (Continued)

Species	Whole period	Coastal cases	Continental cases	10 October (morning)	10 October (afternoon)	Episode period
M2PE	0.31 ± 0.14	NaN	0.28 ± 0.05	0.30 ± 0.04	0.20 ± 0.00	0.36 ± 0.27
NC6H14	0.15 ± 0.11	0.08 ± 0.01	0.15 ± 0.04	0.10 ± 0.03	0.05 ± 0.00	0.28 ± 0.28
IC8H18	0.02 ± 0.02	NaN	0.02 ± 0.01	NaN	NaN	0.05 ± 0.06
NC7H16	0.03 ± 0.01	NaN	0.07 ± 0.00	NaN	NaN	0.07 ± 0.00
NC8H18	0.03 ± 0.00	NaN	0.03 ± 0.00	NaN	NaN	0.03 ± 0.00
EBENZ	0.05 ± 0.04	0.02 ± 0.01	0.05 ± 0.01	0.05 ± 0.02	0.01 ± 0.00	0.08 ± 0.09
MXYL	0.03 ± 0.03	0.01 ± 0.00	0.03 ± 0.01	0.03 ± 0.01	0.01 ± 0.00	0.02 ± 0.02
OXYL	0.04 ± 0.03	0.01 ± 0.00	0.03 ± 0.01	0.03 ± 0.01	0.01 ± 0.00	0.03 ± 0.03
CH2O2	1.02 ± 0.44	0.58 ± 0.08	1.03 ± 0.19	1.16 ± 0.20	1.55 ± 0.11	1.54 ± 0.47
C2H4O2	2.76 ± 1.46	1.59 ± 0.34	3.03 ± 0.68	4.54 ± 0.35	3.19 ± 0.61	4.38 ± 3.25
C2H8O2	0.06 ± 0.02	0.06 ± 0.00	0.06 ± 0.01	0.05 ± 0.00	0.04 ± 0.00	0.09 ± 0.06
C5H8	0.31 ± 0.24	0.16 ± 0.06	0.36 ± 0.14	0.69 ± 0.46	0.56 ± 0.33	0.54 ± 0.25
C4H6O	0.16 ± 0.10	0.06 ± 0.01	0.22 ± 0.06	0.26 ± 0.05	0.15 ± 0.06	0.32 ± 0.19
C3H4O2	0.12 ± 0.05	0.06 ± 0.01	0.13 ± 0.03	0.16 ± 0.02	0.13 ± 0.02	0.19 ± 0.10
C3H6O2	0.90 ± 0.43	0.57 ± 0.15	0.97 ± 0.23	1.26 ± 0.03	1.01 ± 0.11	1.45 ± 0.93
C6H6	0.28 ± 0.13	0.12 ± 0.03	0.33 ± 0.03	0.43 ± 0.04	0.25 ± 0.05	0.38 ± 0.21
C6H12	0.02 ± 0.01	0.01 ± 0.00	0.03 ± 0.00	0.03 ± 0.01	0.02 ± 0.01	0.04 ± 0.03
C3H4O3	0.05 ± 0.02	0.03 ± 0.00	0.05 ± 0.01	0.07 ± 0.01	0.07 ± 0.00	0.06 ± 0.03
C7H8	0.38 ± 0.27	0.20 ± 0.10	0.46 ± 0.11	0.50 ± 0.08	0.24 ± 0.04	0.69 ± 0.67
C8H10	0.25 ± 0.22	0.09 ± 0.08	0.35 ± 0.07	0.49 ± 0.17	0.07 ± 0.05	0.41 ± 0.34
C10H16	0.05 ± 0.03	0.03 ± 0.00	0.06 ± 0.01	0.10 ± 0.06	0.09 ± 0.04	0.07 ± 0.03
CH2O	1.03 ± 0.41	0.62 ± 0.05	1.17 ± 0.11	1.72 ± 0.10	1.59 ± 0.17	1.17 ± 0.42
C2H4O	1.88 ± 0.90	0.98 ± 0.13	2.10 ± 0.41	2.74 ± 0.16	1.96 ± 0.36	3.17 ± 1.98
C3H6O	3.88 ± 1.60	2.18 ± 0.31	4.43 ± 0.74	5.64 ± 0.49	5.91 ± 0.47	5.92 ± 2.85
C3H4O	0.25 ± 0.11	0.14 ± 0.02	0.29 ± 0.05	0.39 ± 0.04	0.33 ± 0.05	0.39 ± 0.19
C4H8O	0.45 ± 0.30	0.24 ± 0.04	0.53 ± 0.16	0.59 ± 0.05	0.44 ± 0.05	0.87 ± 0.86
C8H8O	0.04 ± 0.03	0.02 ± 0.00	0.05 ± 0.01	0.06 ± 0.00	0.04 ± 0.01	0.08 ± 0.06
BVOC	0.3 ± 0.4	0.2 ± 0.1	0.4 ± 0.1	1.1 ± 0.6	0.8 ± 0.4	0.7 ± 0.5
AVOC	7.1 ± 3.6	4.0 ± 0.7	7.6 ± 0.9	7.7 ± 0.9	4.4 ± 0.7	11.1 ± 8.7
OVOC	7.2 ± 7.4	7.0 ± 1.0	9.2 ± 1.5	18.6 ± 1.3	16.4 ± 1.9	14.9 ± 12.8
TEXs_PTR	0.4 ± 0.5	0.3 ± 0.2	0.6 ± 0.1	1.0 ± 0.2	0.3 ± 0.1	0.9 ± 1.1
C5H8Deri	0.3 ± 0.3	0.2 ± 0.1	0.4 ± 0.1	0.9 ± 0.5	0.7 ± 0.4	0.7 ± 0.5
Arom	0.6 ± 0.6	0.4 ± 0.2	0.8 ± 0.1	1.5 ± 0.3	0.6 ± 0.1	1.2 ± 1.3
Alkane	6.5 ± 3.4	3.6 ± 0.5	6.8 ± 0.8	6.3 ± 0.6	3.8 ± 0.6	9.9 ± 7.5
Alkene	2.5 ± 1.9	0.5 ± 0.1	2.2 ± 0.2	2.6 ± 0.2	1.0 ± 0.5	2.5 ± 1.0
Aldehyde	4.4 ± 4.5	4.2 ± 0.5	5.7 ± 0.8	11.4 ± 0.8	10.4 ± 1.1	9.1 ± 7.6
Acid	2.8 ± 2.9	2.8 ± 0.5	3.4 ± 0.6	7.2 ± 0.5	5.9 ± 0.8	5.8 ± 5.2

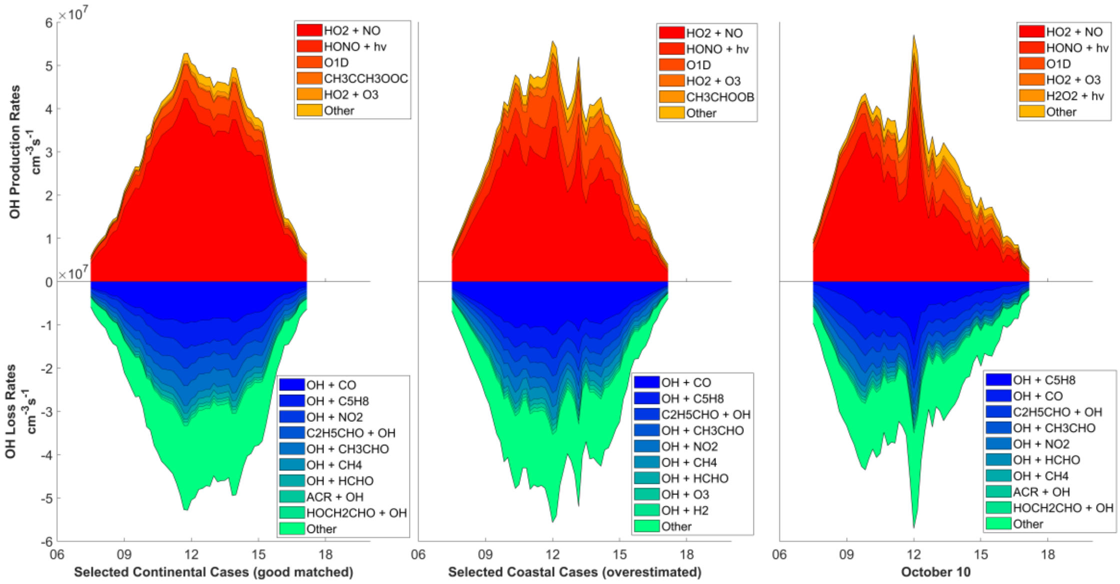

Figure S3. OH radical budgets for the continental cases, coastal cases, and 10 October

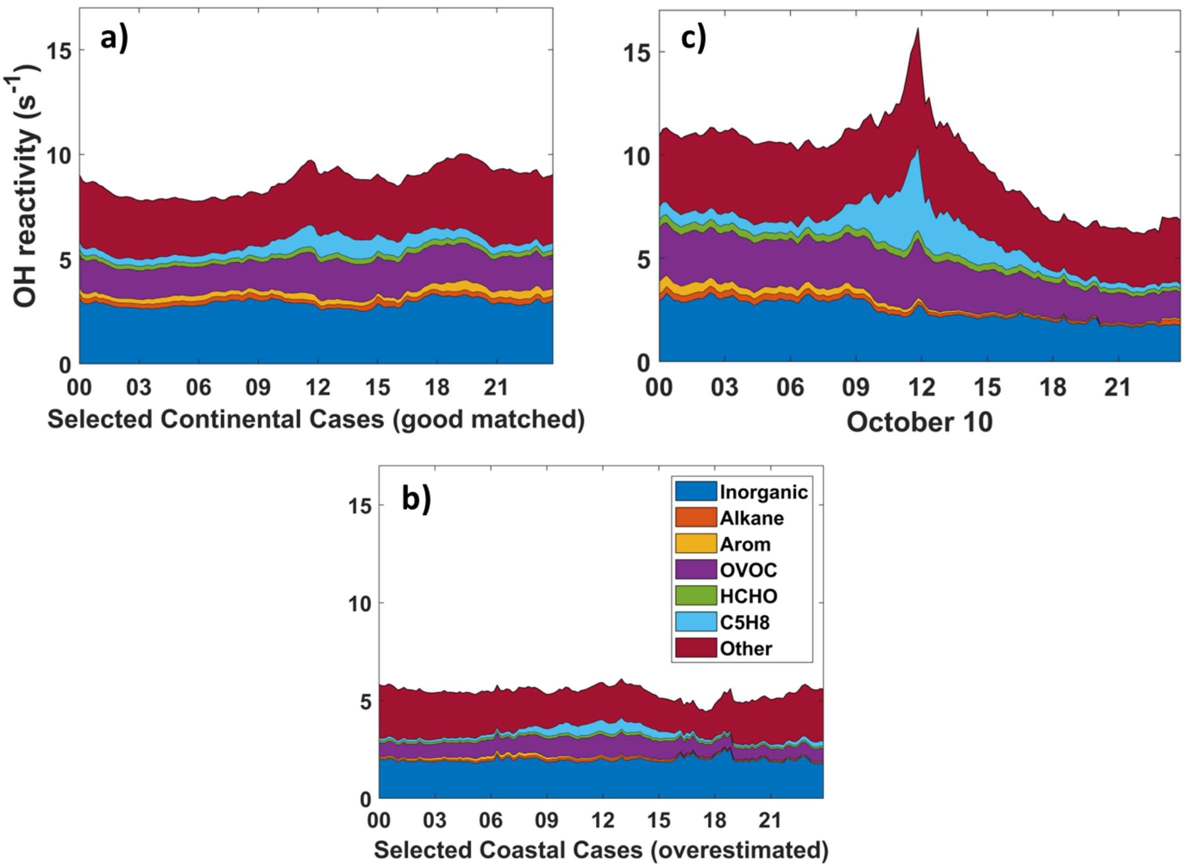

Figure S4. Calculated reactivity for continental cases (a), coastal cases (b), and 10 October (c).

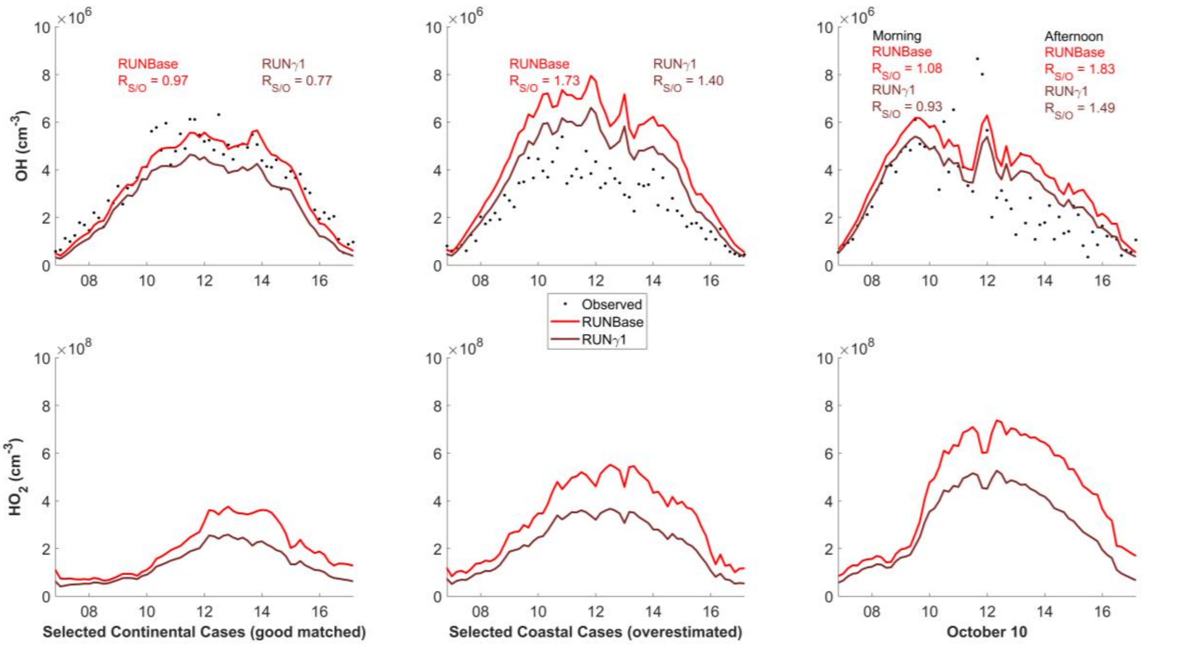

Figure S5. Sensitivity tests for the simulated OH and HO_2 in continental and coastal cases and on 10 October. RUNγ1 shows the simulated results for the maximum heterogeneous uptake effect of HO_2 ($\gamma = 1$).

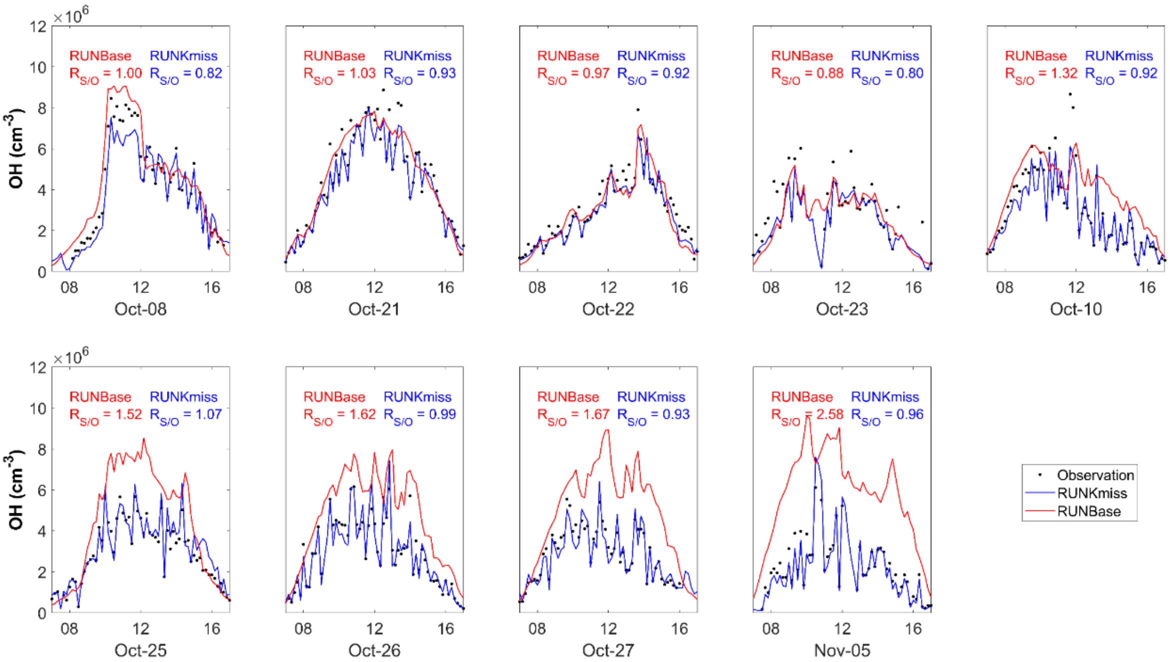

Figure S6. Nine-day comparison between observed OH and simulated OH with (RUNBase) and without (RUNKmiss) addition reactivity.