atmosphere

Supplementary Materials: Insights on in-situ photochemistry associated with ozone reduction in Guangzhou during the COVID-19 lockdown

Kit Ying Shek [1], Yangzong Zeren [1], Hai Guo [1], Mei Li [2,3,4], Ming Liu [5], Bo Huang [5] and Xiaopu Lyu [1,*]

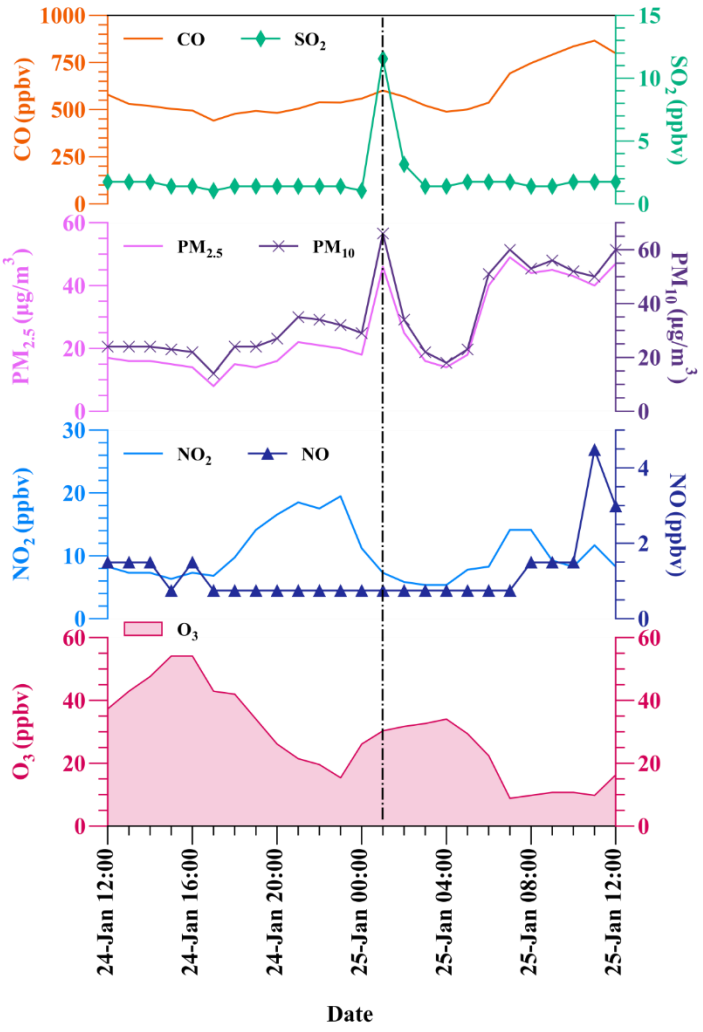

Figure S1. Variations of criteria air pollutants and NO from 12:00 on 24 January to 12:00 on 25 January.

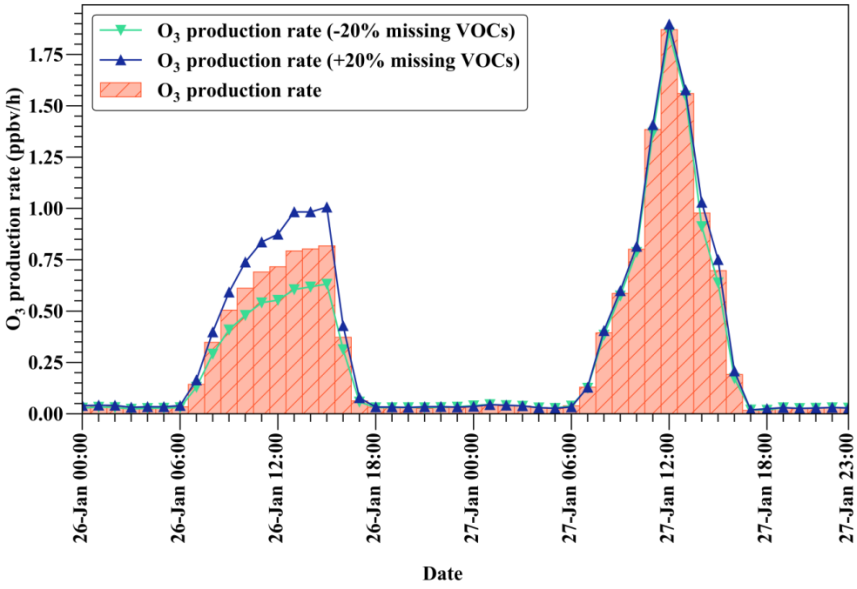

Figure S2. Responses of the simulated O_3 production rate to ±20% changes in the estimated mixing ratios of VOCs on 26 and 27 January 2020.

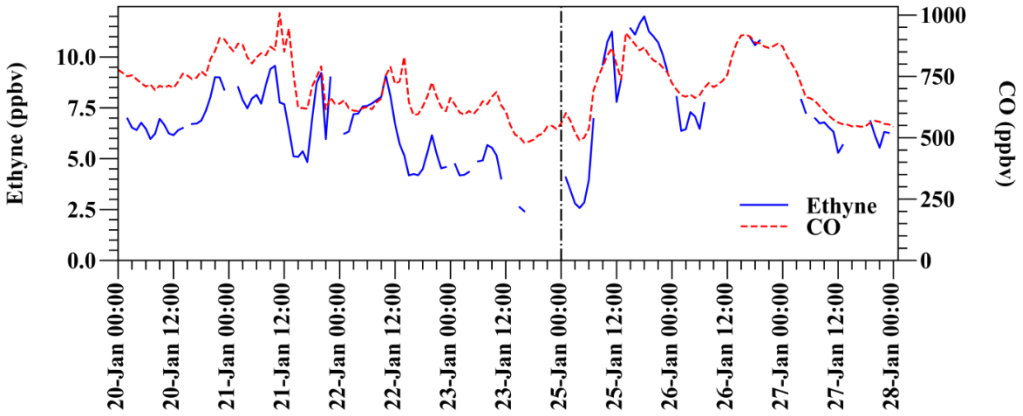

Figure S3. Time series of CO and ethyne in the shorter study period (transitional week). The dashed line separates the Pre-LD and LD periods.

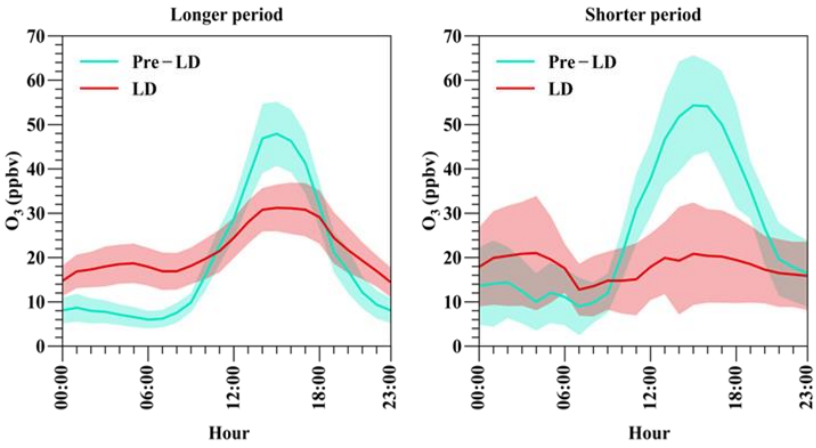

Figure S4. Average diurnal profiles of O_3 during the Pre-LD and LD in the longer (left panel) and shorter study period (right panel).

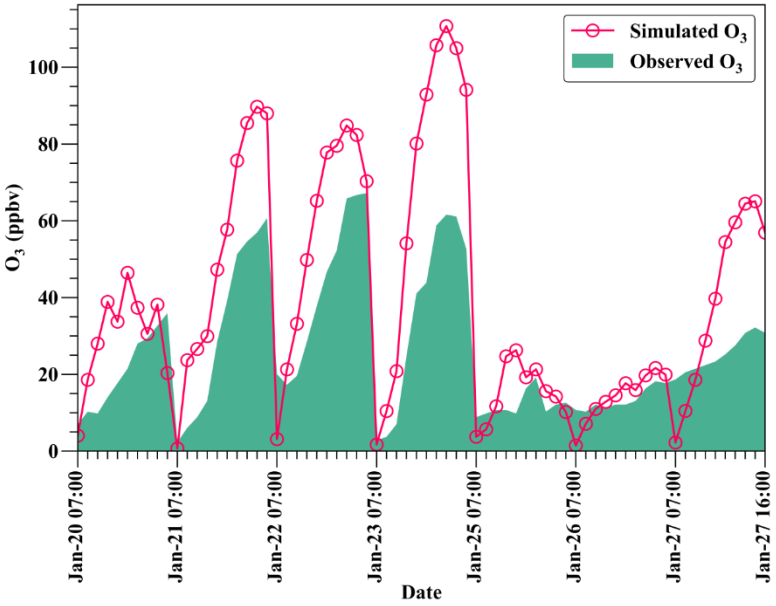

Figure S5. Time series of the simulated and observed O_3 between 7:00 and 16:00 on 20–27 January excluding 24 January.

Table S1. VOCs, OVOCs and trace gases that are input into the PBM-MCM model.

No.	Name	No.	Name
1	Ethane	27	*trans*-2-Pentene
2	Propane	28	Isoprene
3	*i*-Butane	29	1-Hexene
4	*n*-Butane	30	Benzene
5	*i*-Pentane	31	Toluene
6	2,2-Dimethylbutane	32	Ethylbenzene
7	2,3-Dimethylbutane	33	*m/p*-Xylene
8	2-Methylpentane	34	*o*-Xylene
9	3-Methylpentane	35	Styrene
10	*n*-Hexane	36	*n*-Propylbenzene
11	2-Methylhexane	37	3-Ethyltoluene
12	Cyclohexane	38	4-Ethyltoluene
13	3-Methylhexane	39	1,3,5-Trimethylbenzene
14	*n*-Heptane	40	2-Ethyltoluene
15	*n*-Octane	41	1,2,4-Trimethylbenzene
16	*n*-Decane	42	1,2,3-Trimethylbenzene
17	*n*-Hendecane	43	Chloromethane
18	Dodecane	44	1,1,1-Trichloroethane
19	Ethene	45	Trichloroethylene
20	Propene	46*	Acetone
21	Ethyne	47*	Methyl *tert*-butyl ether
22	*trans*-2-Butene	48#	CO
23	*cis*-2-Butene	49#	SO_2
24	1-Butene	50#	NO_2
25	1,3-Butadiene	51#	NO
26	1-Pentene	52#	O_3

* OVOC species; # Trace gases.

Table S2. O_3 production and destruction pathways included in calculation of net O_3 production rate.

O_3 production pathways	O_3 destruction pathways
$HO_2 + NO$	$OH + NO_2$
$RO_2 + NO$	O_3 + Alkenes
	$O^1D + H_2O$

	O_3 + OH
	O_3 + HO_2

Table S3. Coefficients of determination for the correlations between CO and some VOC species during the Pre-LD and LD in the shorter study period.

VOC species	Coefficient of determination (r^2)	
	Pre-LD	LD
Ethane	0.25 (n = 78 #)***	0.74 (n = 48)***
Propane	0.16 (n = 78)***	0.50 (n = 48)***
Ethene	0.27 (n = 78)***	0.73 (n = 48)***
Ethyne	0.50 (n = 78)***	0.89 (n = 48)***
Benzene	0.10 (n = 59)*	0.53 (n = 45)***
1,2-Dichloroethane	0.22 (n = 30)**	0.37 (n = 44)***

Number of data points; * P-value < 0.05; ** P-value < 0.01; *** P-value < 0.001.

Table S4. Percentage changes of VOCs between the Pre-LD and LD periods and the P-values.

VOC species	Percentage change (%)	P-value (two-tailed t-test)
Ethane	−1.90	0.65
Propane	−34.9	<0.001
i-Butane	−55.2	<0.001
n-Butane	−45.7	<0.001
i-Pentane	−11.0	0.43
2,3-Dimethylbutane	−2.32	0.81
3-Methylpentane	−10.6	0.21
Methylcyclohexane	−41.1	<0.001
Dodecane	−25.2	0.11
Ethene	−15.9	0.06
Propene	−59.4	<0.01
trans-2-Butene	−49.8	0.08
1,3-Butadiene	−9.52	0.15
1-Pentene	−50.1	<0.01
Ethyne	21.9	<0.001
Benzene	−6.64	0.60
Toluene	−66.8	<0.001
Ethylbenzene	−67.2	<0.001
m/p-Xylene	−66.9	<0.001
o-Xylene	−21.6	<0.001
Styrene	−8.05	<0.05
Cumene	−0.45	0.64
4-Ethyltoluene	−9.71	<0.05
1,2,4-Trimethylbenzene	−9.66	<0.05
1,3-Dichlorobenzene	−0.97	0.55
1,4-Dichlorobenzene	−1.27	0.40
1,2,3-Trimethylbenzene	−3.83	0.16
1,3-Diethylbenzene	−9.82	0.57
1,2-Dichlorobenzene	−7.68	0.61
1,4-Diethylbenzene	−0.40	0.94
Dichlorodifluoromethane	−0.12	0.99
Chloromethane	−0.21	0.99
Vinyl chloride	−0.04	0.99
Fluorotrichloromethane	−10.4	<0.01
1,1,2-Trichlorotrifluoroethane	−4.01	0.33
1,1,1-Trichloroethane	−3.85	0.07
Carbon tetrachloride	−0.15	0.98
Trichloroethylene	−52.3	<0.001
Tribromomethane	−0.12	0.97
Hexachloro-1,3-butadiene	−10.9	0.70
Acetone	-15.0	0.21

Methyl *tert*-butyl ether	−75.8	<0.001
Methyl methacrylate	−6.11	0.73