Supporting Information for

Understanding summertime H_2O_2 chemistry in North China Plain through observations and modelling studies

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Table S1. Lumped VOC groups in RACM2 in this study.

Table S2. Measured species and performance of the instruments.

Figure S1. Observed and modelled H_2O_2 concentrations under different scenarios.

Figure S2. The percentage contribution of different pathways to H_2O_2 production and removal.

Table S1. Lumped VOC groups in RACM2 in this study.

Lumped VOC groups in RACM2	Measured hydrocarbons
ACE	Acetylene
ETH	Ethane
HC3	Propane, *i*-butane, *n*-butane , 2,2-dimethylbutane
HC5	*i*-Pentane, *n*-pentane, cyclopentane, 2,3-dimethylbutane, 2-methylpentane, 3-methylpentane, MTBE, *n*-hexane, 2,3-dimethylpentane, 2,4-dimethylpentane, methylcyclopentane, 2-methylhexane
HC8	Cyclohexane, 3-methylhexane, 2,2,4-trimethylpentane, 2,3,4-trimethylpentane, *n*-heptane, methylcyclohexane, 2-methylheptane, 3-methylheptane, *n*-octane, *n*-nonane, *n*-decane, *n*-undecane
ETE	Ethylene
OLI	*trans*-2-Butene, *cis*-2-butene, *trans* -2-pentene, *cis*-2-pentene
OLT	Propene, 1-butene, 1-pentene, 1-hexene, styrene
DIEN	1,3-Butadiene
BEN	Benzene
TOL	Toluene, ethylbenzene, *i*-propylbenzene, *n*-propylbenzene
XYO	*o*-Xylene, *o*-ethyltoluene
XYM	*m*-Ethyltoluene , 1,3,5-trimethylbenzene, 1,2,4-trimethylbenzene, 1,2,3-trimethylbenzene, *m*-diethylbenzene
XYP	*m*, *p*-Xylene, *p*-ethyltoluene, *p*-diethylbenzene
ISO	Isoprene
API	Sum of monoterpenes
HCHO	Formaldehyde
ACD	Acetaldehyde
GLY	Glyoxal
ACT	Acetone
MACR	Methacrolein
MVK	Methyl vinyl ketone
MEK	Methyl ethyl ketone

Table S2. Measured species and performance of the instruments.

Species	Measurement techniques	instrument	Detection limit
O_3	UV photometry	Model 49i	0.5 ppb
CO	Infrared absorption	Model 48i	1 ppb
NO	Chemiluminescence	Model 42i	60 ppt
NO_2	Chemiluminescence	Model 42i	0.3 ppb
$PM_{2.5}$	TEOM	TEOM 1400A	1 ppb
SO_2	Infrared absorption	Model 43i	0.1 ppb
H_2O_2	dual enzyme technique	Aero Laser AL2021	50 ppt
PAN	GC-ECD		10 ppt
VOCs	GC-FID		20-300 ppt
HONO	LOPAP	QUMA LOPAP	10 ppt

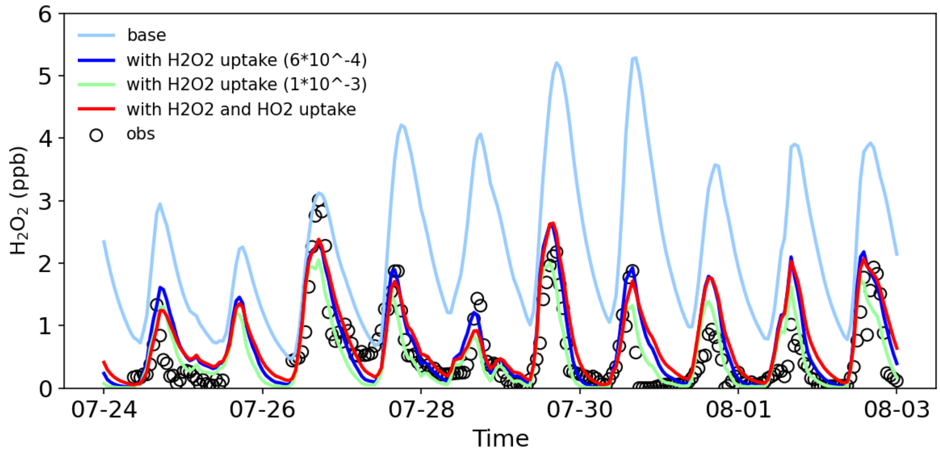

Figure S1. **Observed and modelled H_2O_2 concentrations under different scenarios.**

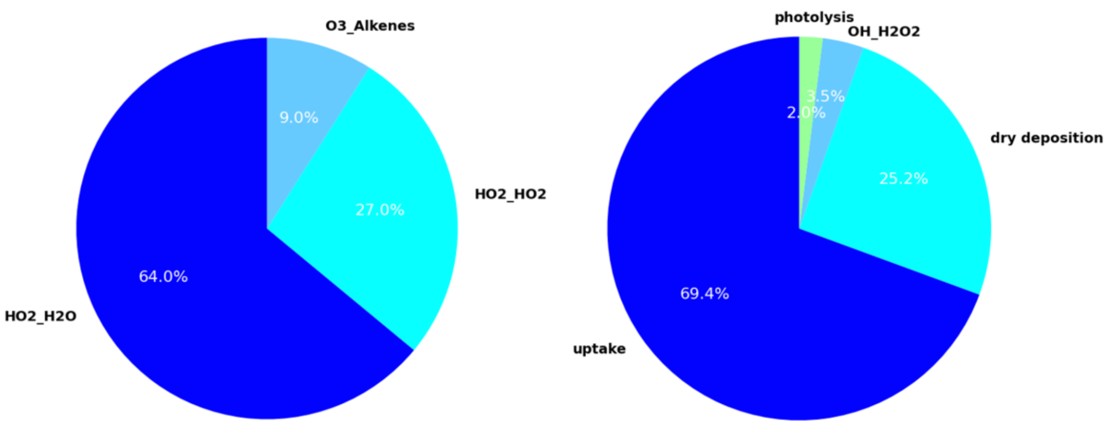

Figure S2. The percentage contribution of different pathways to H_2O_2 production and removal.