

Supplementary Materials of

Parameterized reactivity of hydroxy radical, ozone, nitrate radical and atmospheric oxidation capacity during summer at a suburban site between Beijing and Tianjin

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Figure captions

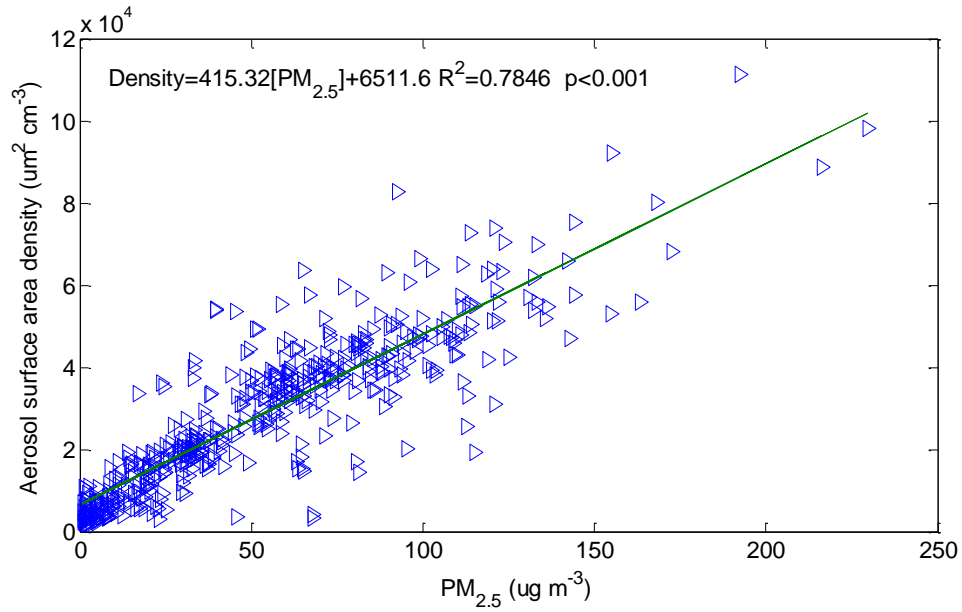


Figure S1. Correlations between aerosol surface area density and $\text{PM}_{2.5}$ measured from 1 to 22 November 2018. The green solid line is the regression line.

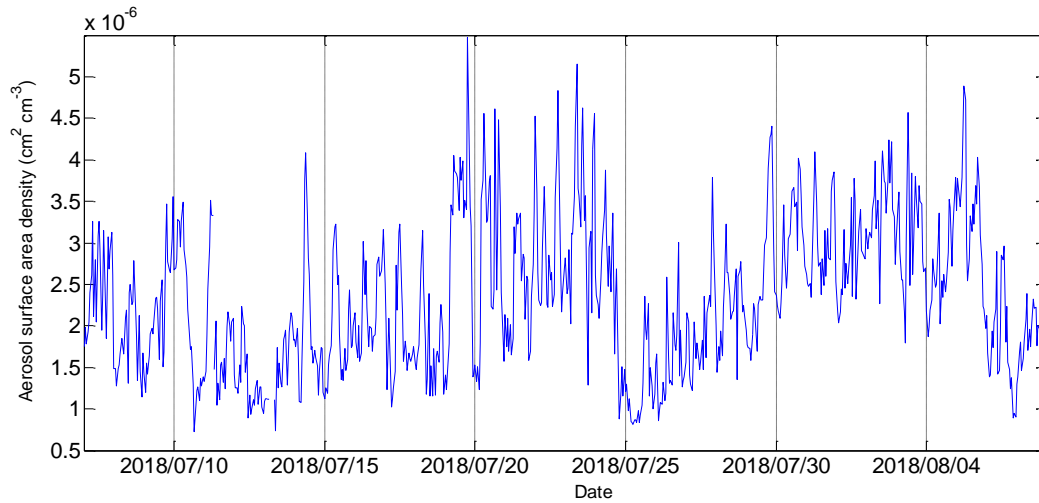


Figure S2. Time series of calculated aerosol surface area density ($\text{cm}^2 \text{cm}^{-3}$) at a suburban site of Xianghe.

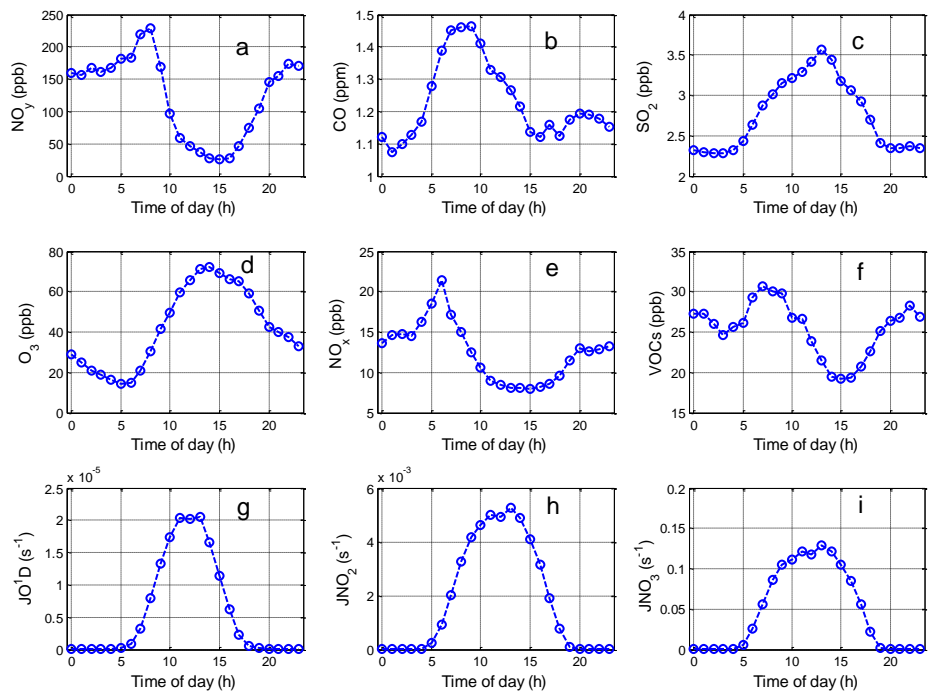


Figure S3. Mean diurnal variations of air pollutants and meteorological parameters observed during the field campaign at Xianghe from 6 July to 6 August 2018.

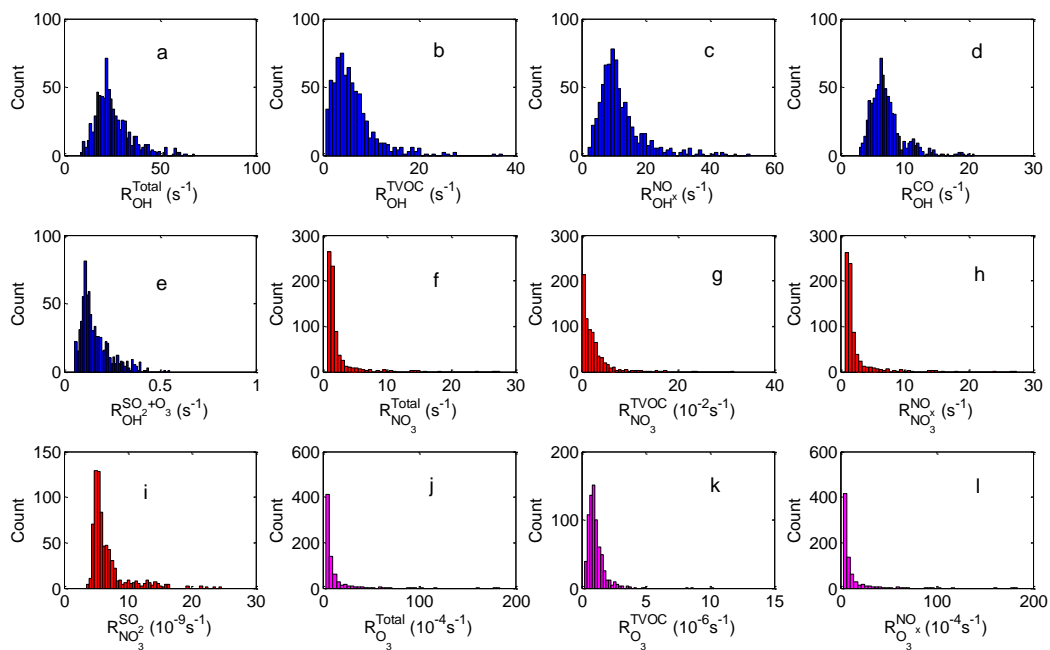


Figure S4. Frequency distributions of $R_{OH}^{calculated}$, $R_{NO_3}^{calculated}$ and $R_{O_3}^{calculated}$ of trace gases during the field campaign at Xianghe from 6 July to 6 August 2018.

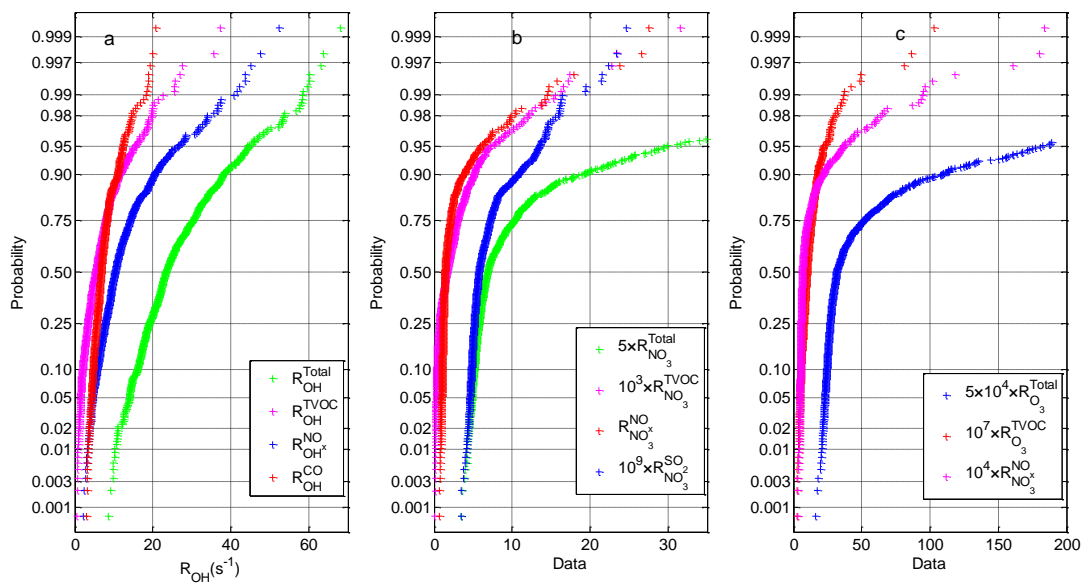


Figure S5. Cumulative frequency distributions of $R_{OH}^{calculated}$, $R_{NO_3}^{calculated}$ and $R_{O_3}^{calculated}$ of trace gases during the field campaign at Xianghe from 6 July to 6 August 2018.

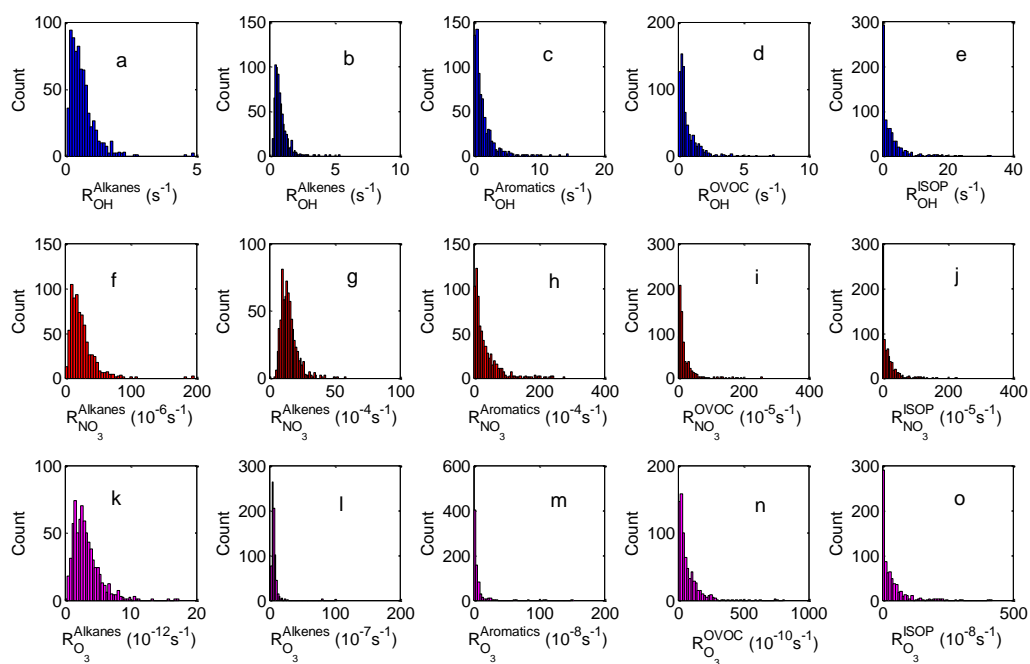


Figure S6. Frequency distributions of $R_{OH}^{calculated}$, $R_{NO_3}^{calculated}$ and $R_{O_3}^{calculated}$ of VOC groups during the field campaign at Xianghe from 6 July to 6 August 2018.

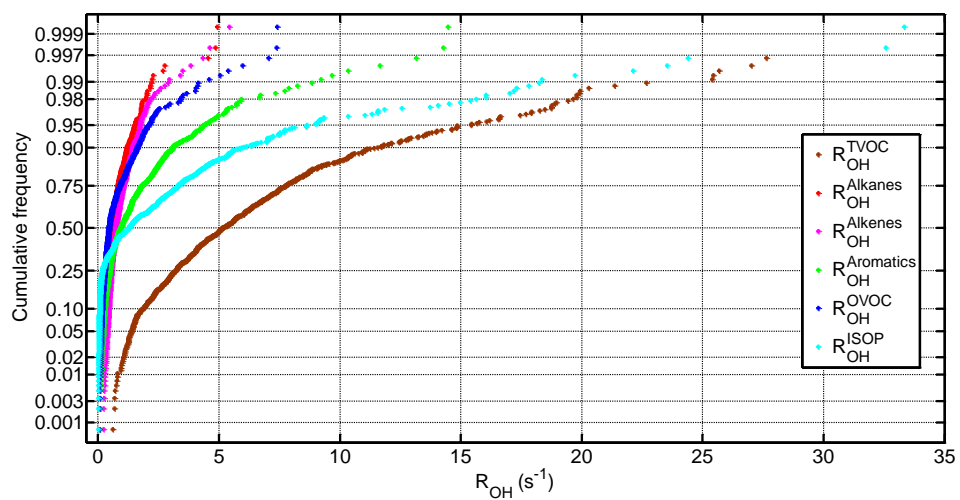


Figure S7. Cumulative frequency distributions of $R_{OH}^{calculated}$ of VOC groups during the field campaign at Xianghe from 6 July to 6 August 2018.

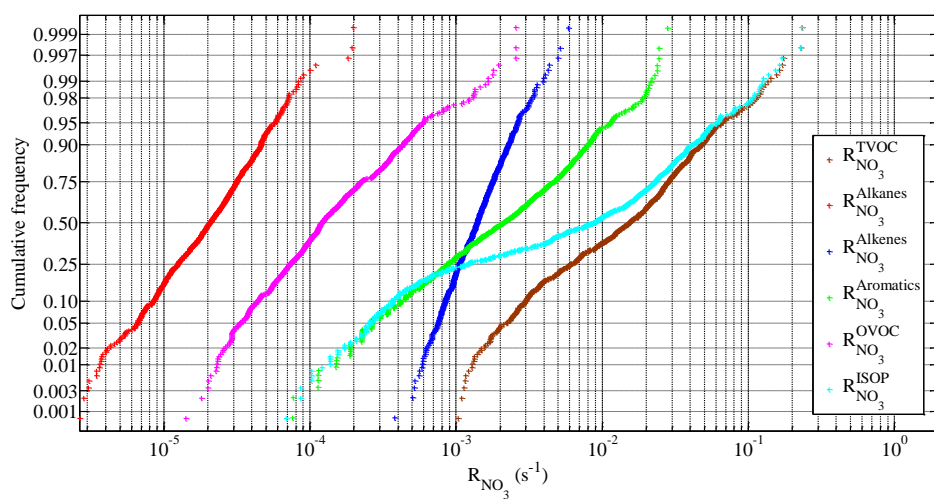


Figure S8. Cumulative frequency distributions of $R_{NO_3}^{\text{calculated}}$ of VOC groups during the field campaign at Xianghe from 6 July to 6 August 2018.

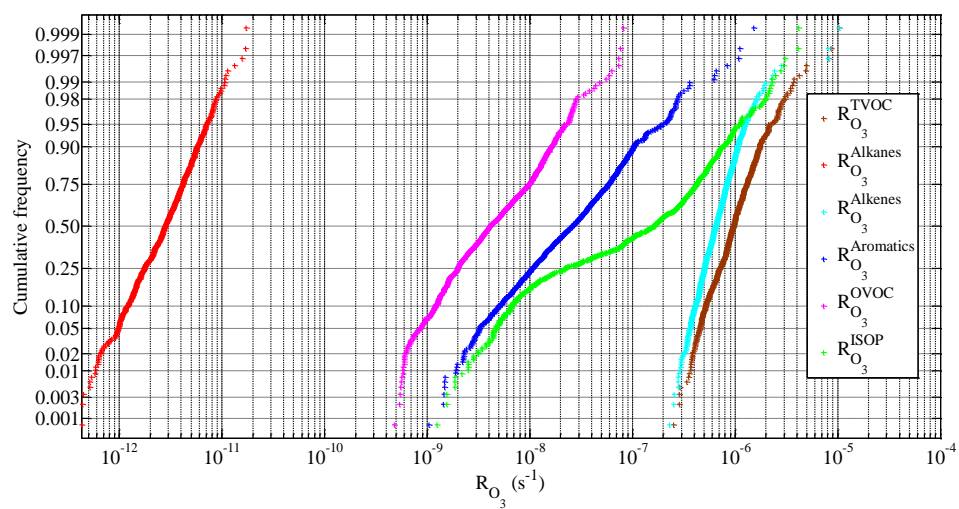


Figure S9. Cumulative frequency distributions of $R_{O_3}^{\text{calculated}}$ of VOC groups during the field campaign at Xianghe from 6 July to 6 August 2018.

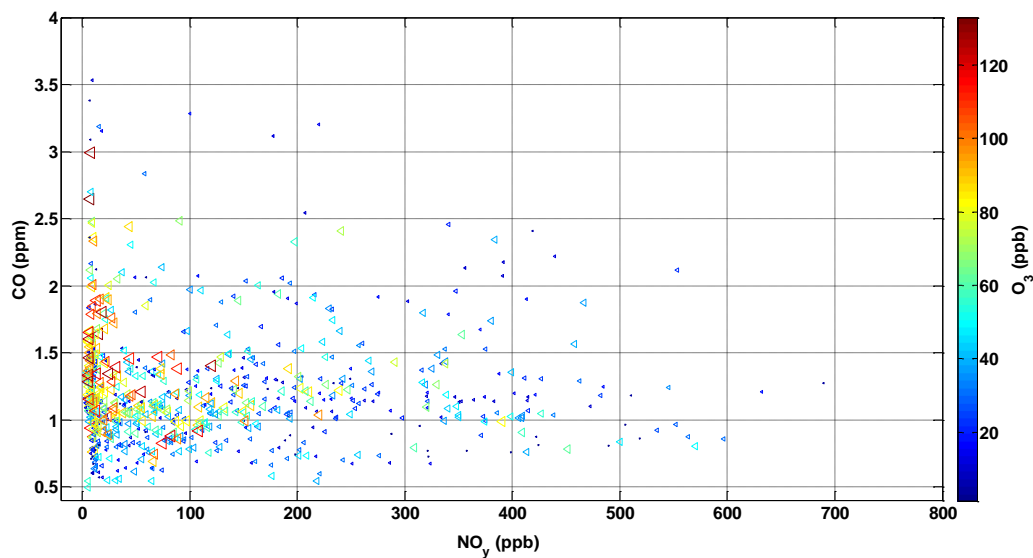


Figure S10. Scatter plots of CO-NO_y color-coded with O₃ concentrations. It shows that high O₃ levels are generally associated with air masses of high CO/NO_y ratio. As VOCs generally have good correlations with CO and play a similar role as CO in photochemical ozone production, the O₃-CO-NO_y relationship strongly indicates a VOC-limited regime of O₃ formation in Xianghe.

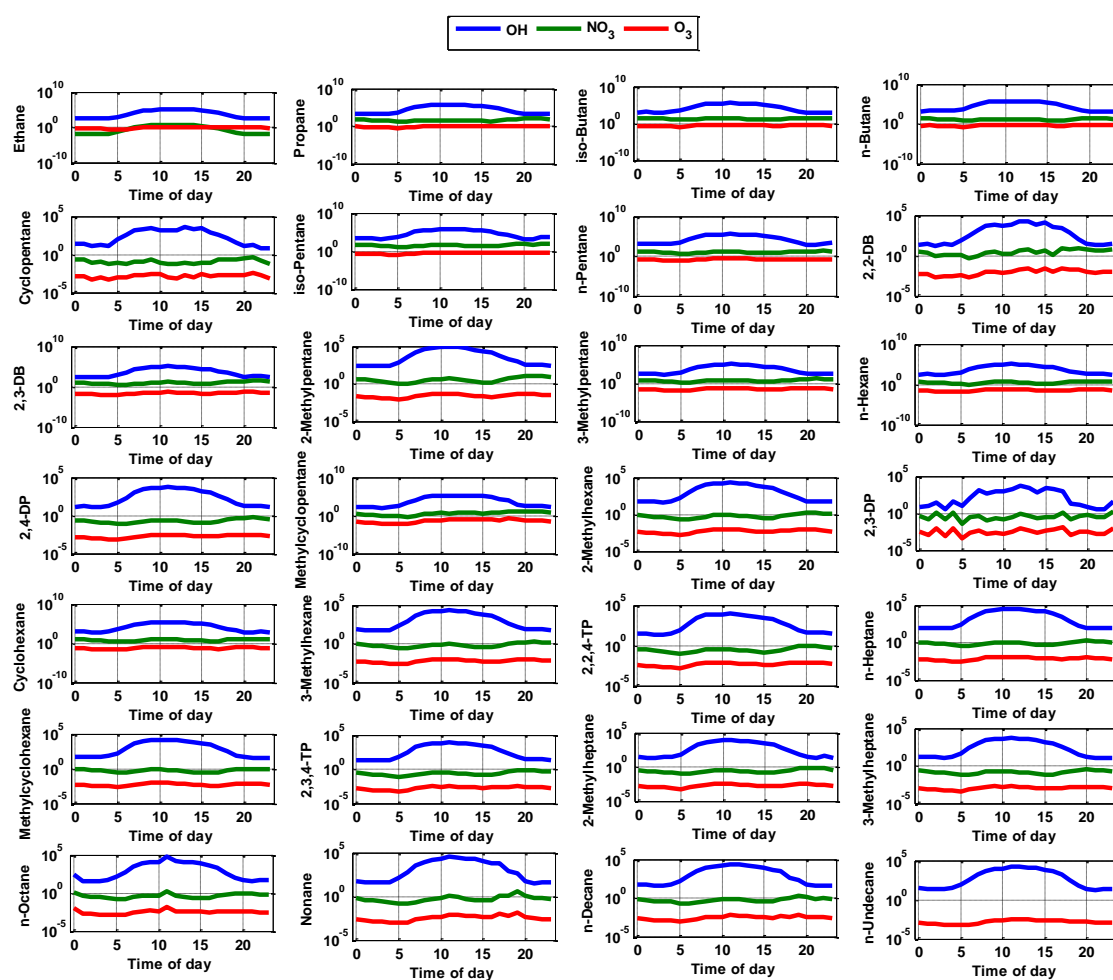


Figure S11. Diurnal variations of alkane species due to the reactions with OH radical (blue lines), NO₃ radical (green lines) and O₃ (red lines) (unit: molecules cm⁻³ s⁻¹). 2,2-DB: 2,2-Dimethylbutane; 2,3-DB: 2,3-Dimethylbutane; 2,4-DP: 2,4-Dimethylpentane; 2,3-DP: 2,3-Dimethylpentane; 2,2,4-TP: 2,2,4-Trimethylpentane; 2,3,4-TP: 2,3,4-Trimethylpentane.

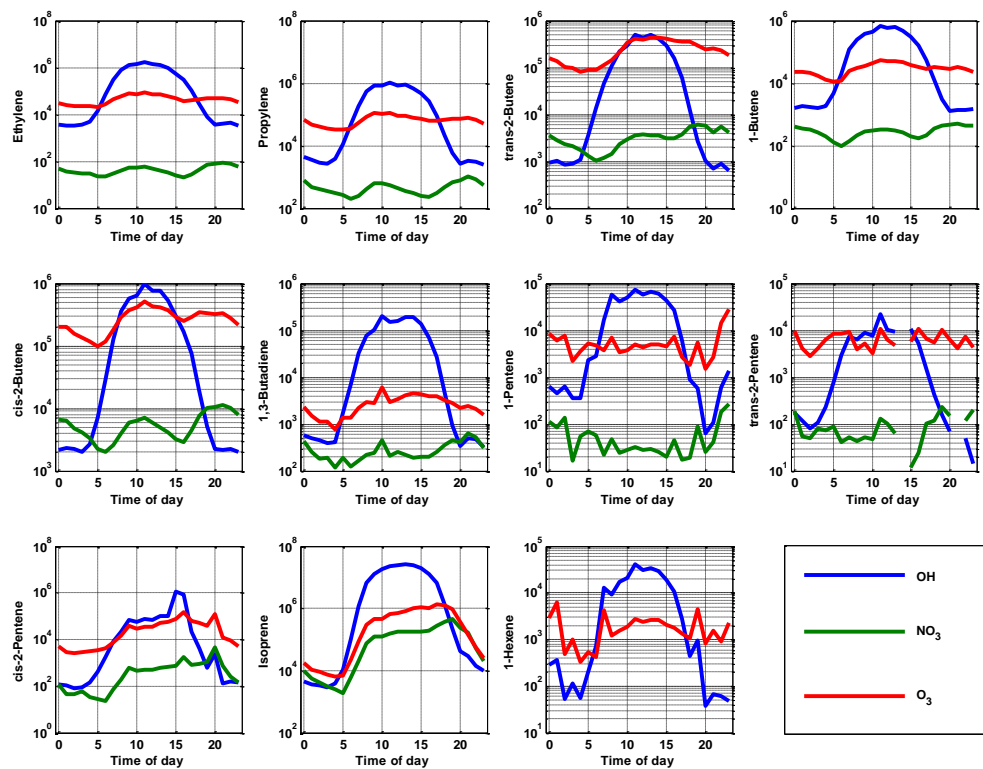


Figure S12. Diurnal variations of alkene species due to the reactions with OH radical (blue lines), NO₃ radical (green lines) and O₃ (red lines) (unit: molecules cm⁻³ s⁻¹).

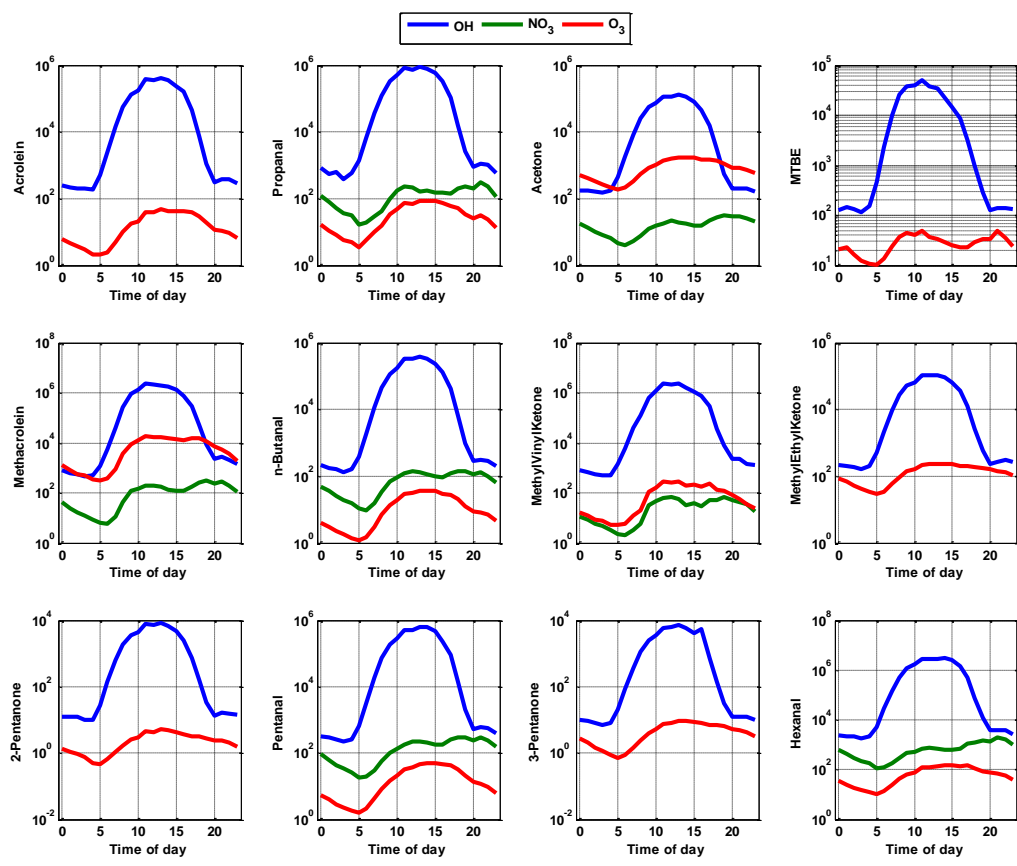


Figure S13. Diurnal variations of OVOC species due to the reactions with OH radical (blue lines), NO₃ radical (green lines) and O₃ (red lines) (unit: molecules cm⁻³ s⁻¹).

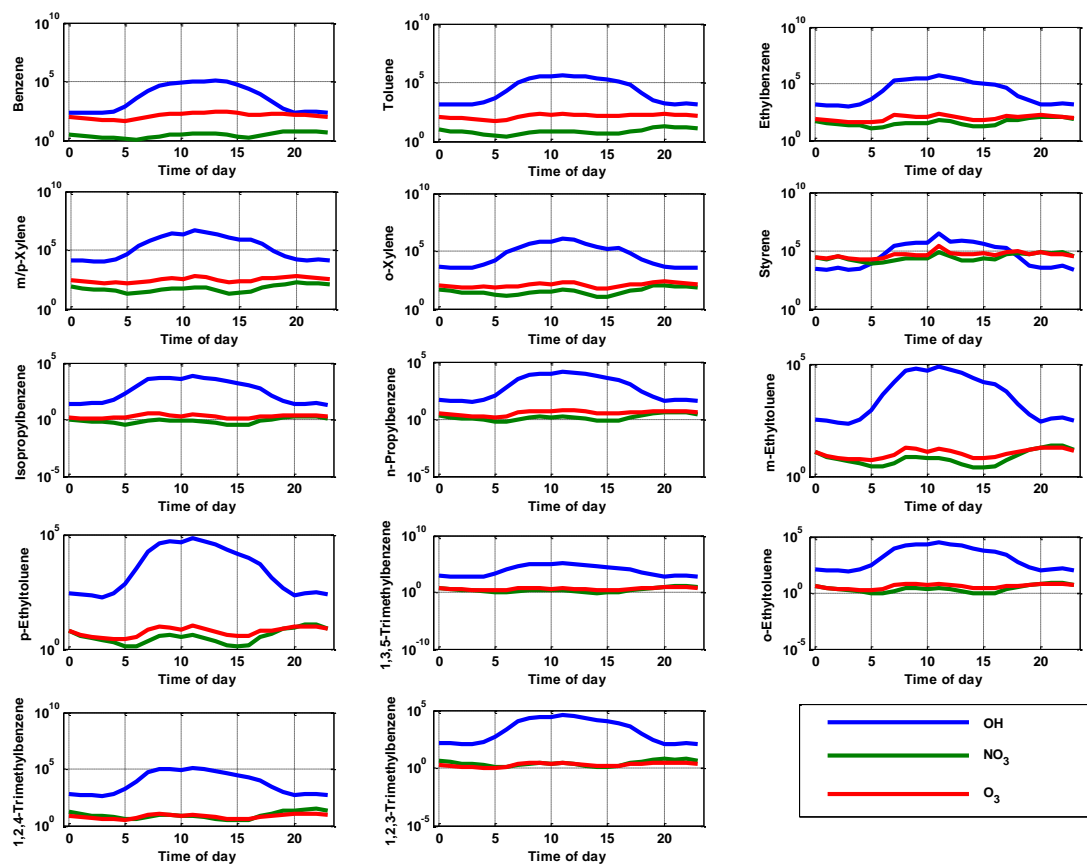


Figure S14. Diurnal variations of aromatic species due to the reactions with OH radical (blue lines), NO₃ radical (green lines) and O₃ (red lines) (unit: molecules cm⁻³ s⁻¹).

Table captions

Table S1. VOC species for the calculation of R_{OH} , R_{NO_3} and R_{O_3} in this study.

VOCs groups	Species included
Alkanes	Ethane, propane, iso-butane, n-butane, cyclopentane, iso-pentane, n-pentane, 2,2-dimethylbutane, 2,3-dimethylbutane, 2-methylpentane, 3-methylpentane, n-hexane, 2,4-dimethylpentane, methylcyclopentane, 2-methylhexane, 2,3-dimethylpentane, cyclohexane, 3-methylhexane, 2,2,4-trimethylpentane, n-heptane, methylcyclohexane, 2,3,4-trimethylpentane, 2-methylheptane, 3-methylheptane, n-octane, nonane, n-decane, n-undecane
Alkenes	Ethylene, propylene, trans-2-butene, 1-butene, cis-2-butene, 1,3-butadiene, 1-pentene, trans-2-pentene, cis-2-pentene, 1-hexene
Aromatics	Benzene, toluene, ethylbenzene, m/p-xylene, o-xylene, styrene, isopropylbenzene, n-propylbenzene, m-ethyltoluene, p-ethyltoluene, o-ethyltoluene, 1,3,5-trimethylbenzene, 1,2,4-trimethylbenzene, 1,2,3-trimethylbenzene.
OVOCs	Acrolein, propanal, acetone, MTBE, methacrolein, n-butanal, methylvinylketone, methylethylketone, 2-pentanone, pentanal, 3-pentanone, hexanal
Isoprene	Isoprene