Supplement of

Effects of NO_x and SO_2 on the Secondary Organic Aerosol Formation from Photooxidation of α-pinene and Limonene

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Table S1. Detailed conditions of the experiments in this study

Experiment No.	VOC (ppb)	SO_2 added (ppb)	NO added (ppb)	T (K)[a]	RH (%)[b]	Scheme
#1	α-pinene (20.2)	0	0	304-311-314	32	Low NO_x low SO_2
#2	α-pinene (21.4)	0	19	307-314-317	29	Low NO_x high SO_2
#3	α-pinene (17.5)	15	0	291-298-302	34	High NO_x low SO_2
#4	α-pinene (18.7)	15	17	300-303-305	42	High NO_x how SO_2
#5	Limonene (7.4)	0	0	294-303-307	31	Low NO_x low SO_2
#6	Limonene (7.5)	0	25	303-310-313	28	Low NO_x high SO_2
#7	Limonene (7.8)	15	0	293-301-305	29	High NO_x low SO_2
#8	Limonene (7.4)	15	17	296-305-309	28	High NO_x high SO_2
#9	Limonene (6.0)	2	17	296-306-310	28	High NO_x moderate SO_2

[a]: The minimum, average and maximum temperature are shown.

[b]: The average RHs of the period of monoterpenes photooxidation are shown.

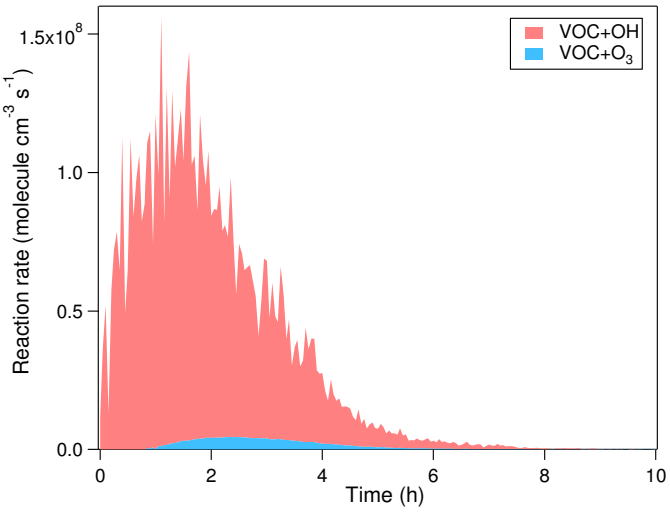
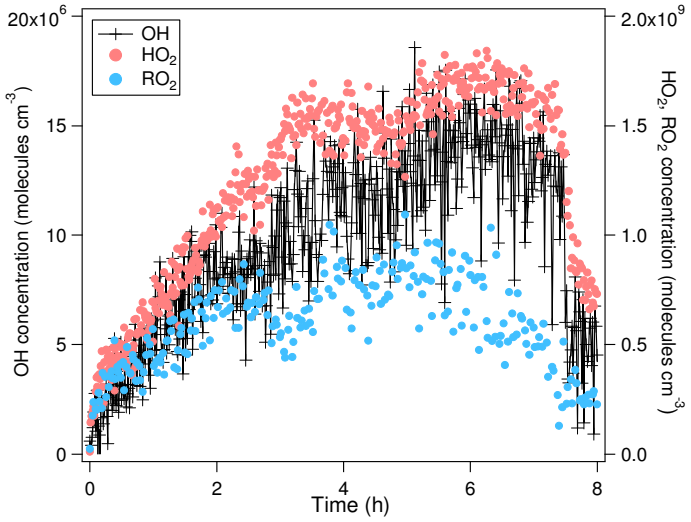


Figure S1. Comparison of the reaction rates of monoterpene with OH and with O_3 in a typical experiment of this study. The reaction rate of VOC+OH is stacked on that of VOC+O_3. Monoterpene oxidation was dominated by OH oxidation. Here the data in α-pinene photooxidation at low NO_x are shown. The scattering of the reaction rate of monoterpene with OH is due to the variations in the OH concentrations and OH measurement.



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23 Figure S2. The concentrations of OH, HO_2 and RO_2 radicals in a typical experiment of this study. Here the data in

24 α-pinene photooxidation at low NO_x are shown.

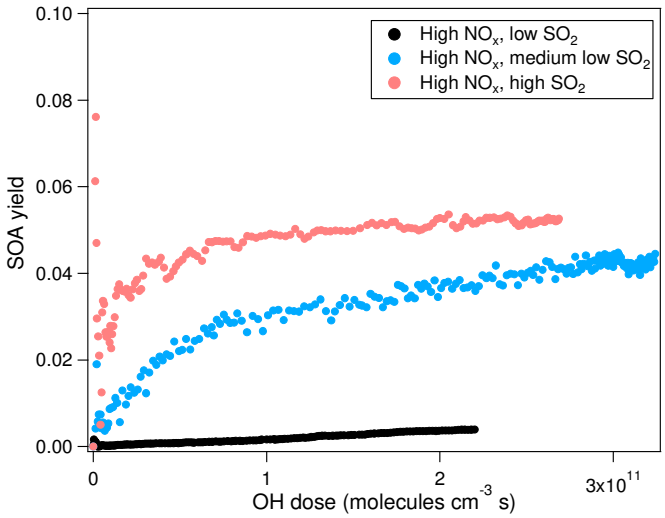

Figure S3. SOA yield at varying SO_2 concentrations for SOA from limonene oxidation at high NO_x. The SO_2 concentrations for low SO_2, moderate SO_2 and high SO_2 are <0.05 ppb, 2 ppb and 15 ppb, respectively.

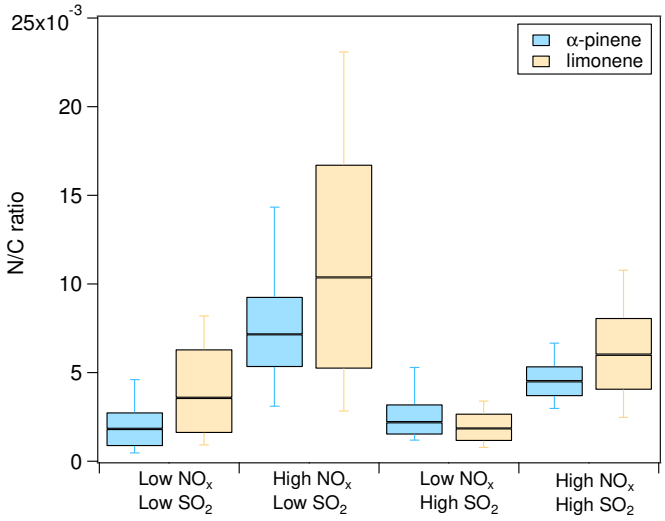

Figure S4. The nitrogen to carbon ratio (N/C) in the SOA formed in different conditions for α-pinene and limonene oxidation. The black line, box, and whiskers show the median, 25th and 75th percentile, and 10th and 90th percentile, respectively.

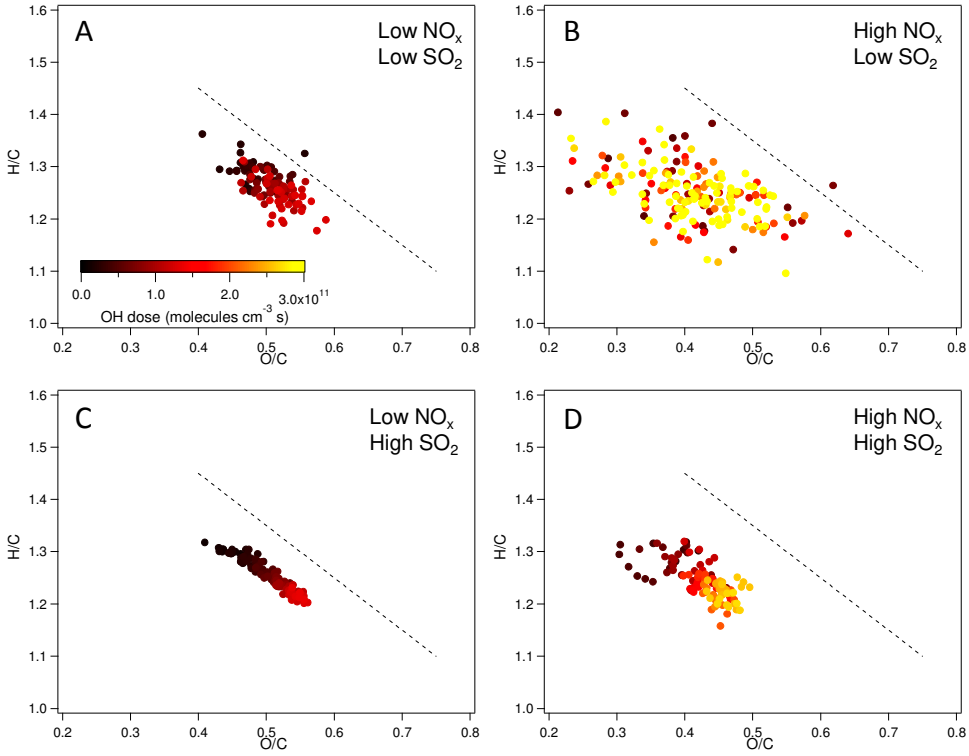

Figure S5. H/C and O/C ratios of SOA from photooxidation of limonene in different NO_x and SO_2 conditions. A: low NO_x, low SO_2, B: high NO_x, low SO_2, C: low NO_x, high SO_2, D: high NO_x, high SO_2. Note that in the high NO_x, low SO_2 condition (panel B), the AMS signal was too low to derive reliable H/C and O/C due to the low particle mass concentration and small particle size. Therefore, the data from an experiment with high NO_x (20 ppb NO) and moderate SO_2 (2 ppb) is shown instead in panel B. The black dashed line corresponds to the slope of -1.

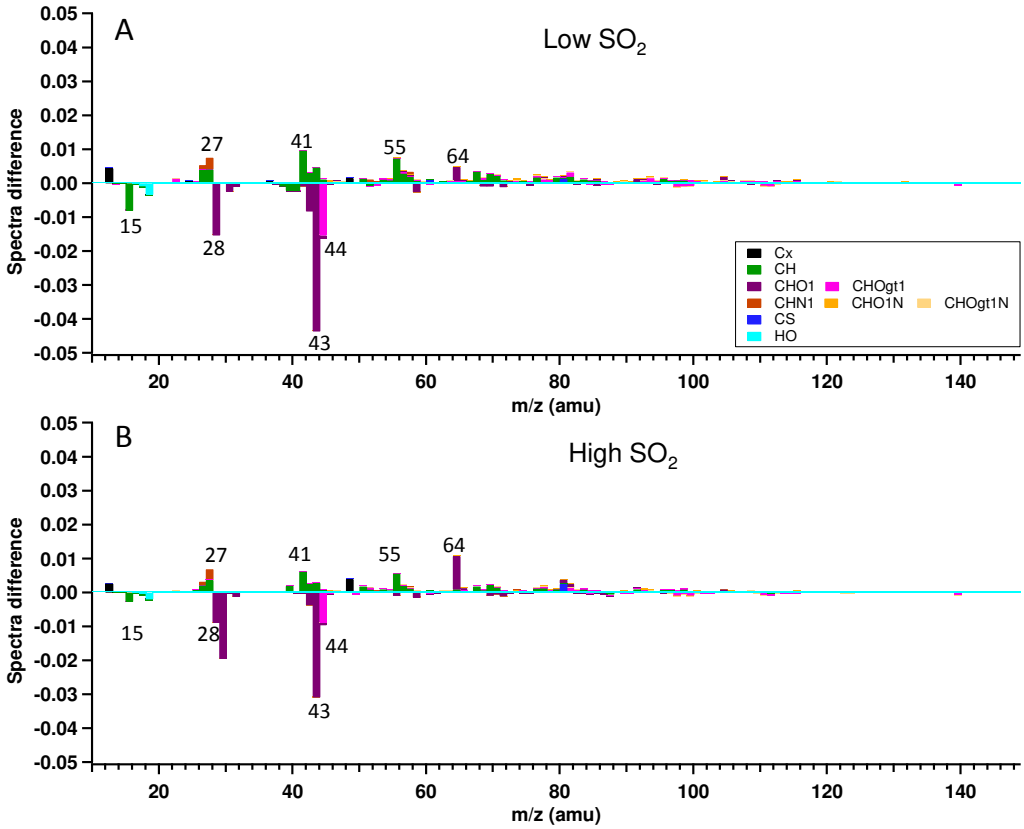

Figure S6. The difference in the mass spectra of organics of the SOA from limonene photooxidation between high NO_x and low NO_x conditions (high NO_x-low NO_x). SOA was formed at low SO_2 (a) and high SO_2 (b). The different chemical family of high resolution mass peaks are stacked at each unit mass *m/z* ("gt1" means greater than 1). The mass spectra were normalized to the total organic signals. Note that in the high NO_x, low SO_2 condition (panel A), the signal of AMS was too low. Therefore, the data in panel A show an experiment with high NO_x (20 ppb NO) and moderate SO_2 (2 ppb) instead.