Journal Name

ARTICLE

Supplementary of

Reactive oxygen species formed in aqueous mixtures of secondary organic aerosols and mineral dust influencing cloud chemistry and public health in the Anthropocene

H. Tong et al.

Correspondence to: h.tong@mpic.de, m.shiraiwa@uci.edu

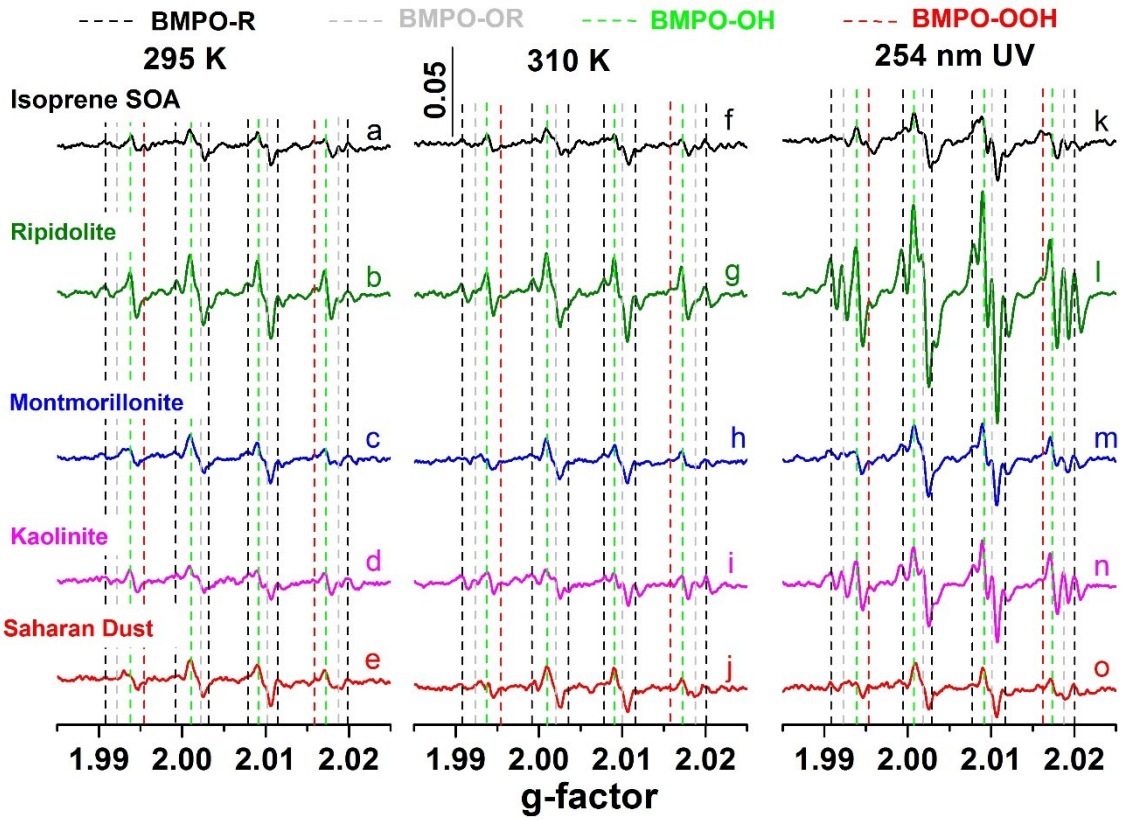

Fig. S1. EPR spectra of BMPO-radical adducts of isoprene SOA (black lines) and its aqueous mixtures with Rapidolite, Montmorillonite, Kaolinite, and Saharan dusts in water. The left column was obtained at 295 K, the middle column were obtained at 310 K, and the right column was obtained 15 min after the mixture exposure to 254 nm UV.

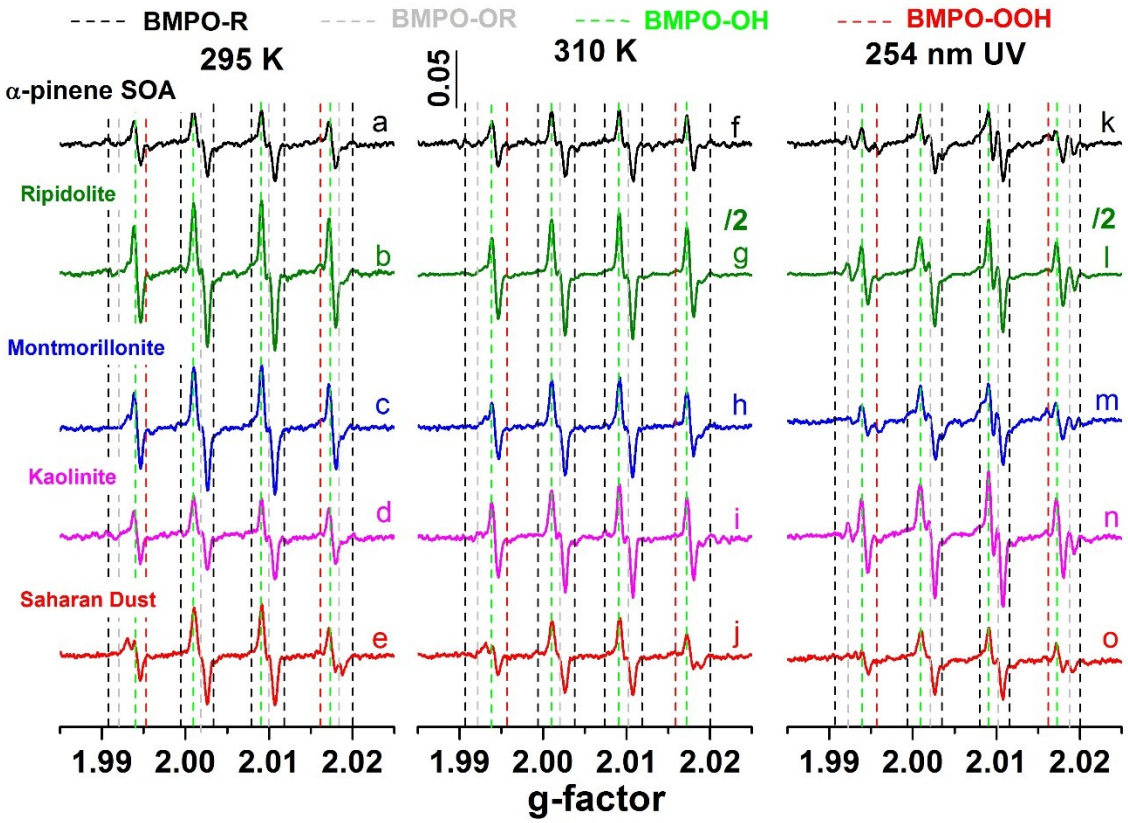

Fig. S2. EPR spectra of BMPO-radical adducts of α-pinene SOA (black lines) and its aqueous mixtures with Rapidolite, Montmorillonite, Kaolinite, and Saharan dusts in water. The left column was obtained at 295 K, the middle column were obtained at 310 K, and the right column was obtained 15 min after the mixture exposure to 254 nm UV.

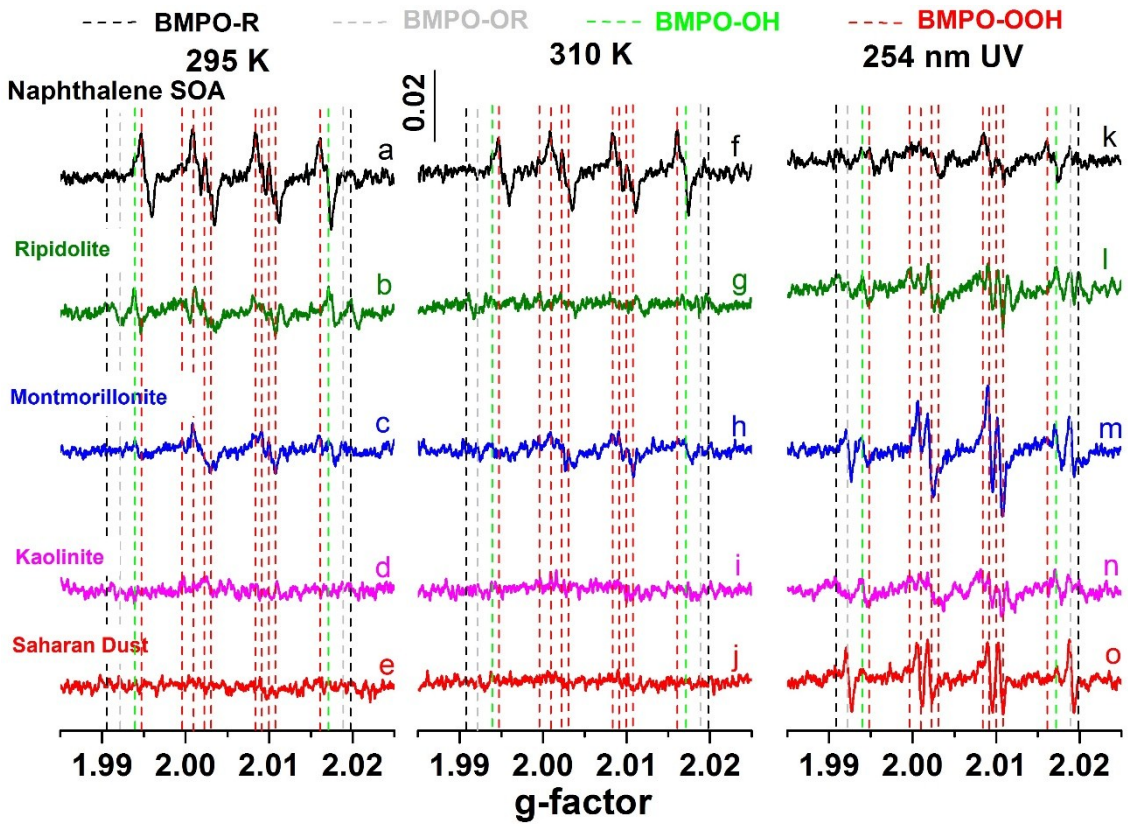

Fig. S3. EPR spectra of BMPO-radical adducts of naphthalene SOA (black lines) and its aqueous mixtures with Rapidolite, Montmorillonite, Kaolinite, and Saharan dusts in water. The left column was obtained at 295 K, the middle column were obtained at 310 K, and the right column was obtained 15 min after the mixture exposure to 254 nm UV.

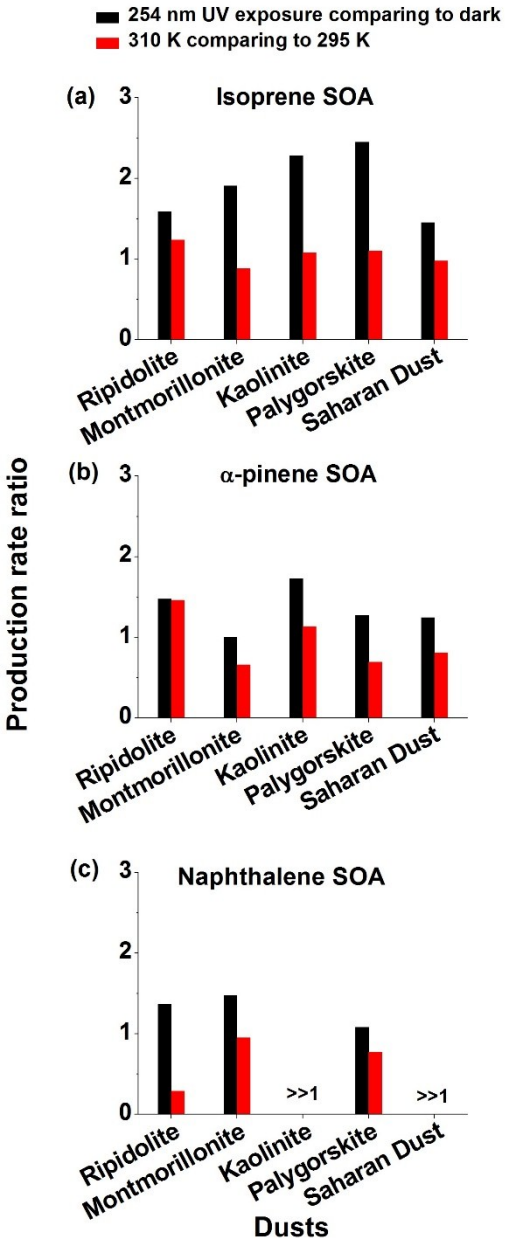

Fig. S4. The production rate ratios of radicals in the aqueous mixtures containing dust and SOA under 254 nm UV exposure and at 310 K comparing to that at 295 K. (a): data for isoprene SOA. (b): data for α–pinene SOA. (c): data for naphthalene SOA.

Table S1: Target MS/MS list for isoprene, α-pinene, and naphthalene SOA

Isoprene SOA		α-pinene SOA		Naphthalene SOA	
Formula $[BMPO+R+H]^+$	m/z (Da) $[BMPO+R+H]^+$	Formula $[BMPO+R+H]^+$	m/z (Da) $[BMPO+R+H]^+$	Formula $[BMPO+R+H]^+$	m/z (Da) $[BMPO+R+H]^+$
CH_3	214	CH_3	214	CH_3	214
OH	216	OH	216	OH	216
CHO	228	CHO	228	CHO	228
OCH_3	230	OCH_3	230	OCH_3	230
OOH	232	OOH	232	OOH	232
C_2H_3O	242	C_2H_3O	242	C_2H_3O	242
CHO_2	244	CHO_2	244	C_2H_5O	244
C_2H_5O	244	C_2H_5O	244	CHO_2	244
CH_3O_2	246	CH_3O_2	246	CH_3O_2	246
C_3H_5O	256	C_3H_5O	256	C_3H_5O	256
$C_2H_3O_2$	258	$C_2H_3O_2$	258	$C_2H_3O_2$	258
$C_2H_5O_2$	260	$C_2H_5O_2$	260	$C_2H_5O_2$	260
CH_3O_3	262	CH_3O_3	262	CH_3O_3	262
$C_3H_5O_2$	272	$C_3H_5O_2$	272	$C_3H_5O_2$	272
$C_2H_3O_3$	274	$C_2H_3O_3$	274	$C_2H_3O_3$	274
$C_2H_5O_3$	276	$C_2H_5O_3$	276	$C_2H_5O_3$	276
C_5H_9O	284	$C_9H_{15}O$	338	C_9H_7O	330
$C_4H_7O_2$	286	$C_9H_{15}O$	338	C_9H_9O	332
$C_5H_{11}O$	286	$C_8H_{13}O_2$	340	$C_8H_5O_2$	332
$C_5H_9O_2$	300	$C_8H_{15}O_2$	342	$C_{10}H_7O$	342
$C_4H_7O_3$	302	$C_8H_{17}O_2$	344	$C_{10}H_9O$	344
$C_5H_9O_3$	316	$C_{10}H_{17}O$	352	$C_9H_7O_2$	346
$C_4H_7O_4$	318	$C_9H_{13}O_2$	352	$C_9H_9O_2$	348
$C_5H_9O_4$	332	$C_9H_{13}O_2$	352	$C_{10}H_7O_2$	358
$C_5H_{11}O_4$	334	$C_9H_{15}O_2$	354	$C_{10}H_8O_2$	359
$C_5H_9O_5$	348	$C_8H_{13}O_3$	356	$C_{10}H_9O_2$	360
$C_8H_{11}O_4$	370	$C_8H_{15}O_3$	358	$C_9H_7O_3$	362
$C_7H_{11}O_5$	374	$C_9H_{13}O_3$	368	$C_9H_9O_3$	364
$C_{10}H_{15}O_5$	414	$C_9H_{13}O_3$	368	$C_8H_5O_4$	364
$C_{11}H_{15}O_6$	442	$C_{10}H_{17}O_2$	368	$C_{10}H_7O_3$	374
		$C_9H_{15}O_3$	370	$C_{10}H_9O_3$	376
		$C_8H_{13}O_4$	372	$C_{10}H_5O_4$	388
		$C_9H_{13}O_4$	384	$C_{10}H_7O_4$	390
		$C_{10}H_{17}O_3$	384	$C_{10}H_9O_4$	392
		$C_9H_{13}O_4$	384	$C_{10}H_70_5$	406
		$C_9H_{15}O_4$	386	$C_{10}H_9O_5$	408
		$C_8H_{13}O_5$	388		
		$C_{10}H_{15}O_4$	398		
		$C_{10}H_{17}O_4$	400		
		$C_9H_{13}O_5$	400		
		$C_9H_{13}O_5$	400		
		$C_{10}H_{17}O_5$	416		
		$C_{18}H_{27}O_5$	522		
		$C_{19}H_{31}O_5$	538		

Table S2. Radicals identified with LC-MS/MS in isoprene SOA water extracts upon exposure to 254 nm UV.

Water extraction of isoprene SOA + UV exposure			
Monoisotopic m/z (Da) $[BMPO+R+H]^+$	**Assigned formula $[BMPO+R+H]^+$**	**Retention time (min)**	**Mass deviation (mDa)**
214.1421	$[BMPO+CH_3+H]^+$	12.5	-1.7
216.1223	$[BMPO+OH+H]^+$	15.2	-0.7
228.1212	$[BMPO+CHO+H]^+$	21.1	-1.8
232.1168	$[BMPO+HO_2+H]^+$	12.9	-1.1
260.1470	$[BMPO+C_2H_5O_2+H]^+$	9.7	-2.2
272.1483	$[BMPO+C_3H_5O_2+H]^+$	17.8	-0.9
316.1743	$[BMPO+C_5H_9O_3+H]^+$	20.2	-1.2
332.1681	$[BMPO+C_5H_9O_4+H]^+$	12.6	-2.3

Table S3. Radicals identified with LC-MS/MS in α-pinene SOA water extracts upon exposure to 254 nm UV.

Water extraction of α-pinene SOA+ UV exposure			
Monoisotopic m/z (Da) $[BMPO+R+H]^+$	**Assigned formula $[BMPO+R+H]^+$**	**Retention time (min)**	**Mass deviation (mDa)**
214.1426	$[BMPO+CH_3+H]^+$	12.5	-1.2
216.1234	$[BMPO+OH+H]^+$	15.2	0.4
230.1375	$[BMPO+CH_2OH+H]^+$	9.8	-1.2
242.1377	$[BMPO+C_2H_3O+H]^+$	21.4	-1.0
244.1531	$[BMPO+C_2H_5O+H]^+$	22.3	-1.2
258.1354	$[BMPO+C_2H_3O_2+H]^+$	20.7	1.8
260.1475	$[BMPO+C_2H_5O_2+H]^+$	9.7/19.0	-1.7
338.2314	$[BMPO+C_9H_{15}O+H]^+$	23.0	-1.2
340.2103	$[BMPO+C_8H_{13}O_2+H]^+$	20.0/20.5/30.0	-1.5
352.2120	$[BMPO+C_9H_{13}O_2+H]^+$	30.5/31.2	0.2
354.2263	$[BMPO+C_9H_{15}O_2+H]^+$	19.3/21.5/21.8	-1.2
356.2053	$[BMPO+C_8H_{13}O_3+H]^+$	19.5	-1.5
366.2261	$[BMPO+C_{10}H_{15}O_2+H]^+$	32.0	-1.4
368.2053	$[BMPO+C_9H_{13}O_3+H]^+$	27.2/27.6	-1.5
368.2407	$[BMPO+C_{10}H_{17}O_2+H]^+$	21.9/22.2/22.5/22.9	-2.4
370.2202	$[BMPO+C_9H_{15}O_3+H]^+$	17.5/17.8/24.1/26.8/28/28.5	-2.2
388.1976	$[BMPO+C_8H_{13}O_5+H]^+$	21.8	1.0
416.2271	$[BMPO+C_{10}H_{17}O_5+H]^+$	31.7	-0.8

Table S4. Radicals identified with LC-MS/MS in naphthalene SOA water extracts upon exposure to 254 nm UV.

Water extraction of naphthalene SOA + UV exposure			
Monoisotopic m/z (Da) $[BMPO+R+H]^+$	**Assigned formula $[BMPO+R+H]^+$**	**Retention time (min)**	**Mass deviation (mDa)**
214.1440	$[BMPO+CH_3+H]^+$	12.5	0.2
216.1231	$[BMPO+OH+H]^+$	15.2	0.1
232.1175	$[BMPO+HO_2+H]^+$	12.9	-0.4
256.1535	$[BMPO+C_3H_5O+H]^+$	13.9	-0.8
260.1479	$[BMPO+C_2H_5O_2+H]^+$	18/18.9/23.9	-1.3
330.1684	$[BMPO+C_9H_7O+H]^+$	33.2/35.9	-1.6
360.1785	$[BMPO+ C_{10}H_9O_2+H]^+$	32.9	-2.0
374.1583	$[BMPO+C_{10}H_7O_3+H]^+$	32.0/36.2	-1.5
376.1743	$[BMPO+C_{10}H_9O_3+H]^+$	18.6	-1.2
390.1530	$[BMPO+C_{10}H_7O_4+H]^+$	24.9	-1.7
392.1689	$[BMPO+C_{10}H_9O_4+H]^+$	21.6	-1.5