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*Supplement of*

## **Seasonal variation of secondary organic aerosol tracers in Central Tibetan Plateau**

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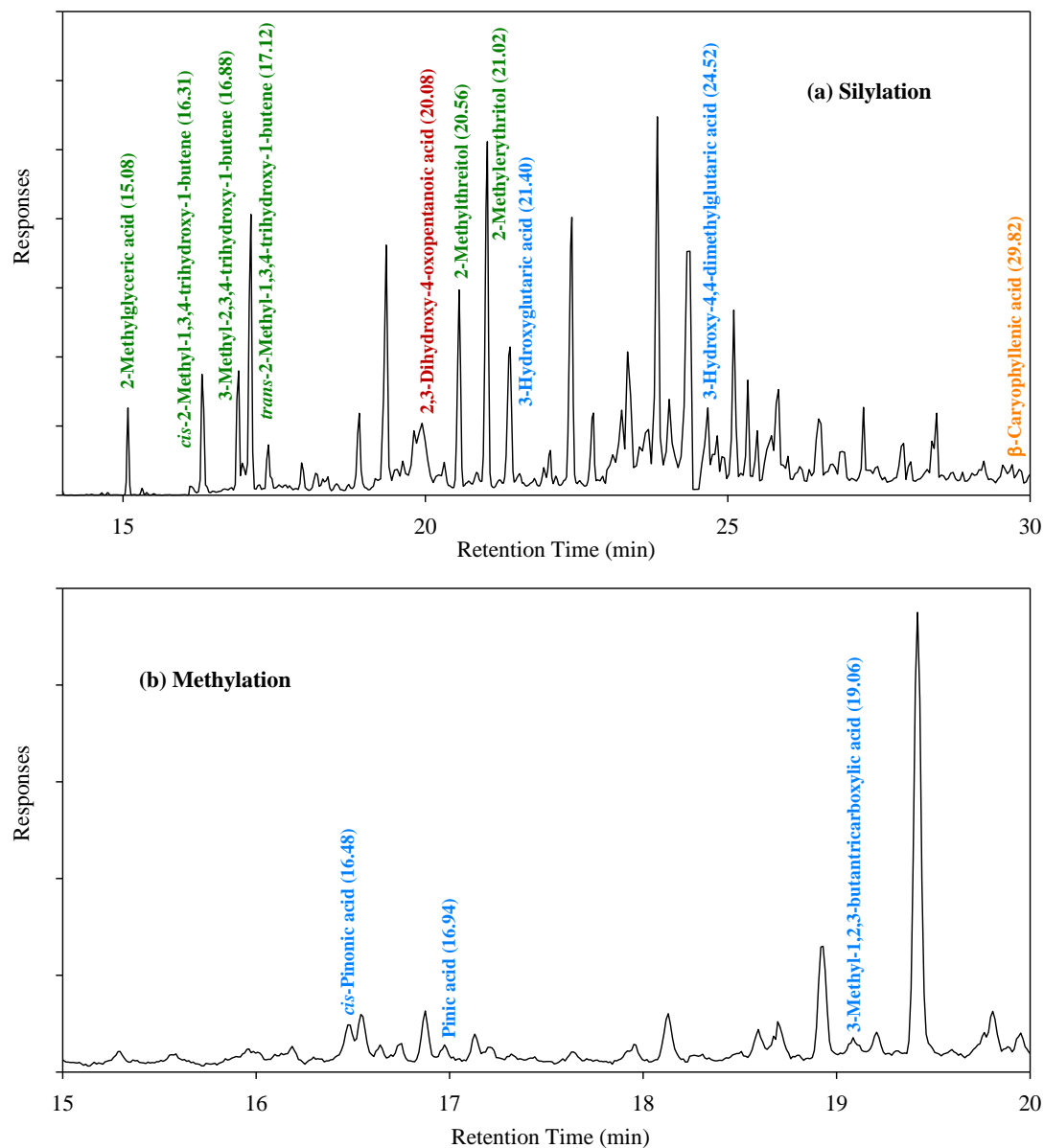


Figure S1 TIC of silylated (a) and methylated samples (b). Retention time of each tracer is labeled in brackets. Green, blue, orange and red represent SOA tracers from isoprene, monoterpenes,  $\beta$ -caryophyllene and aromatics, respectively.

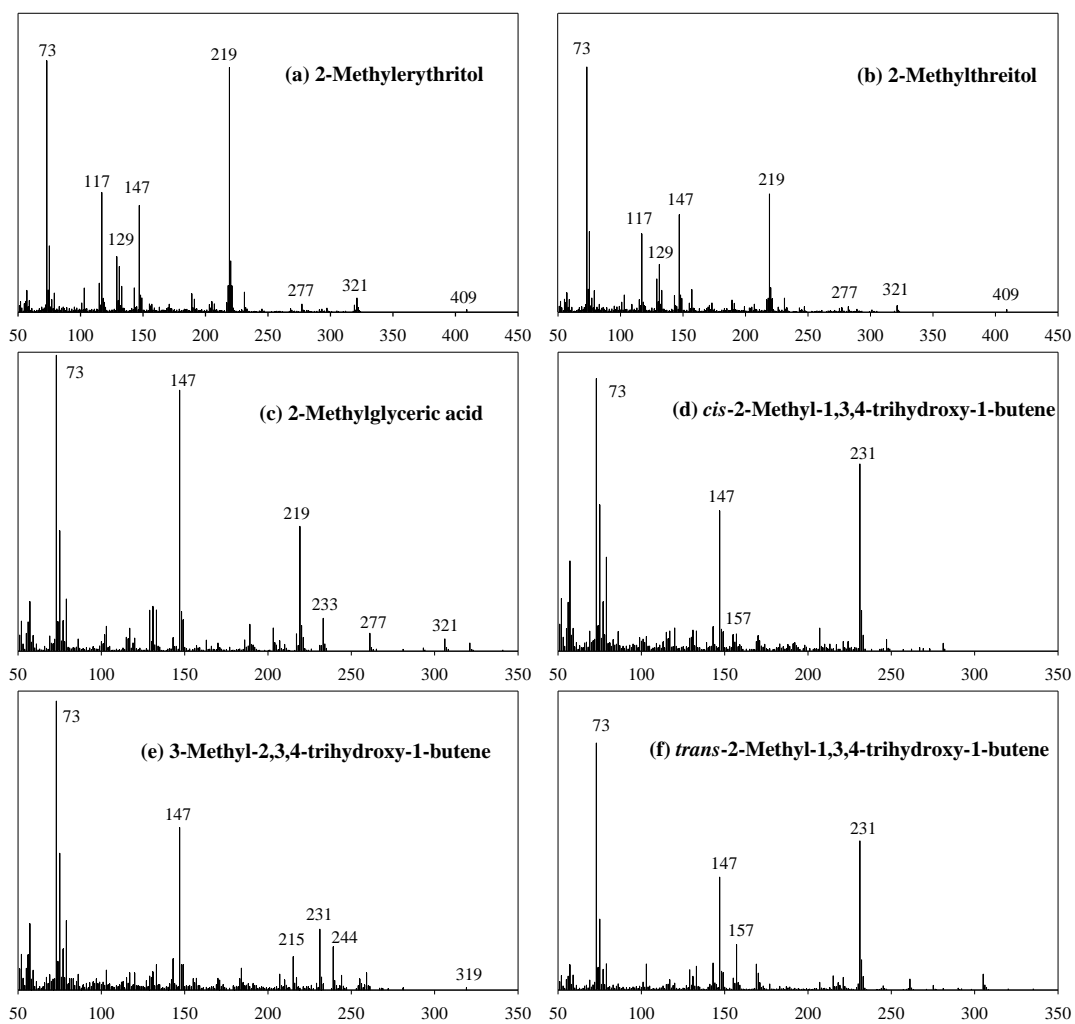


Figure S2 EI spectra of silylated isoprene SOA tracers

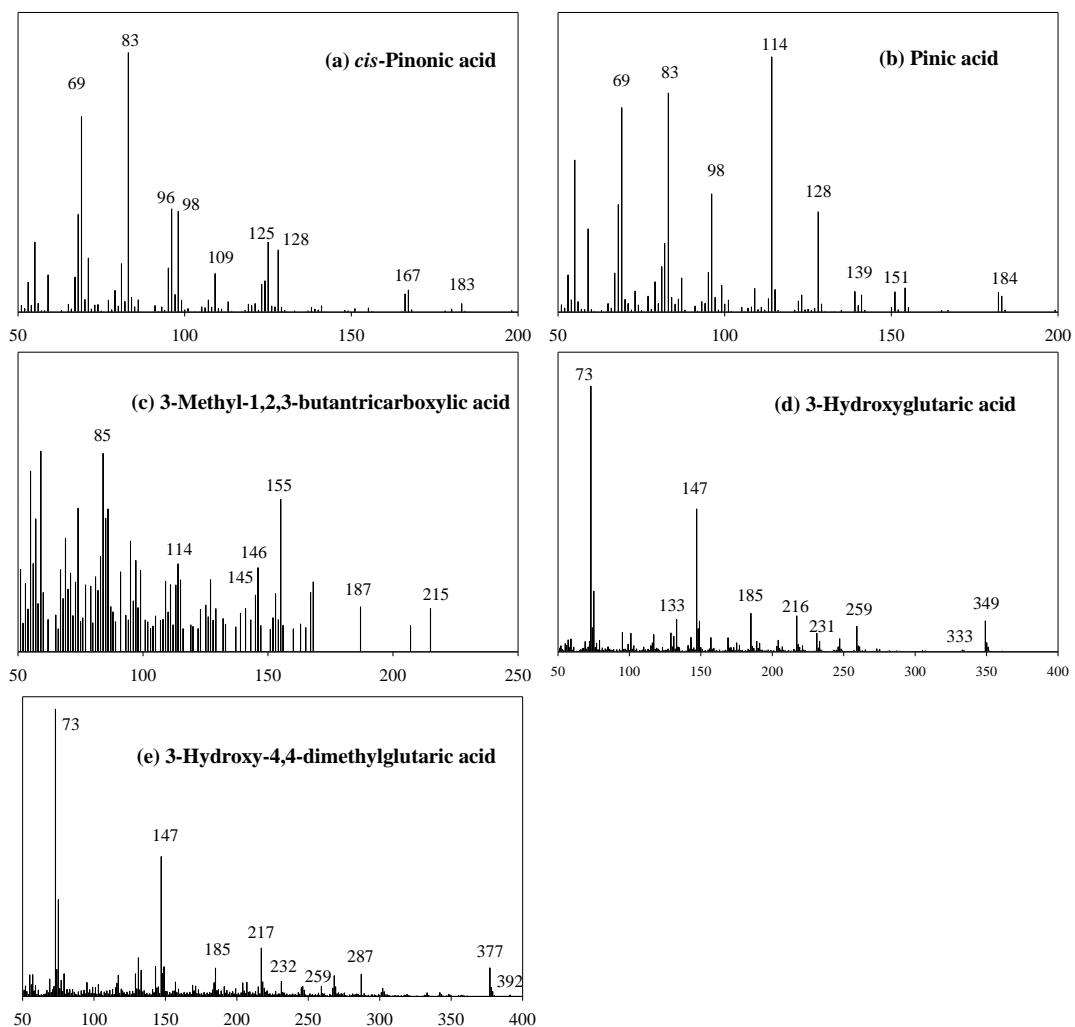


Figure S3 EI spectra of methylated (a-c) and silylated (d and e) monoterpene SOA tracers

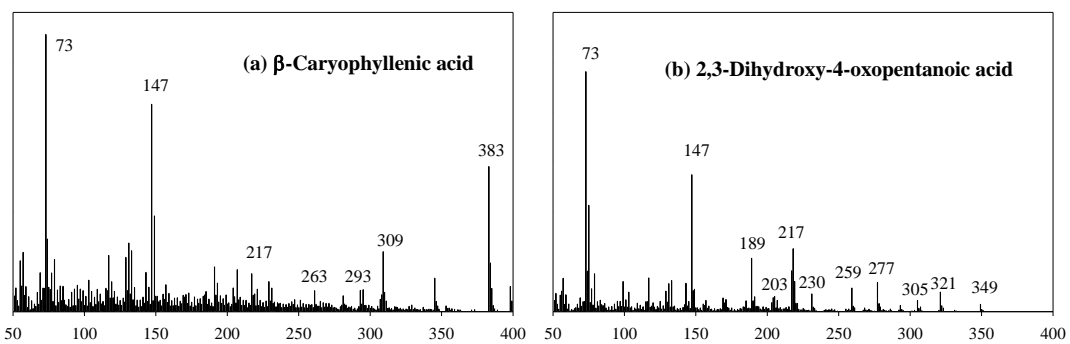


Figure S4 EI spectra of silylated SOA tracers from  $\beta$ -caryophyllene (a) and aromatics (b)

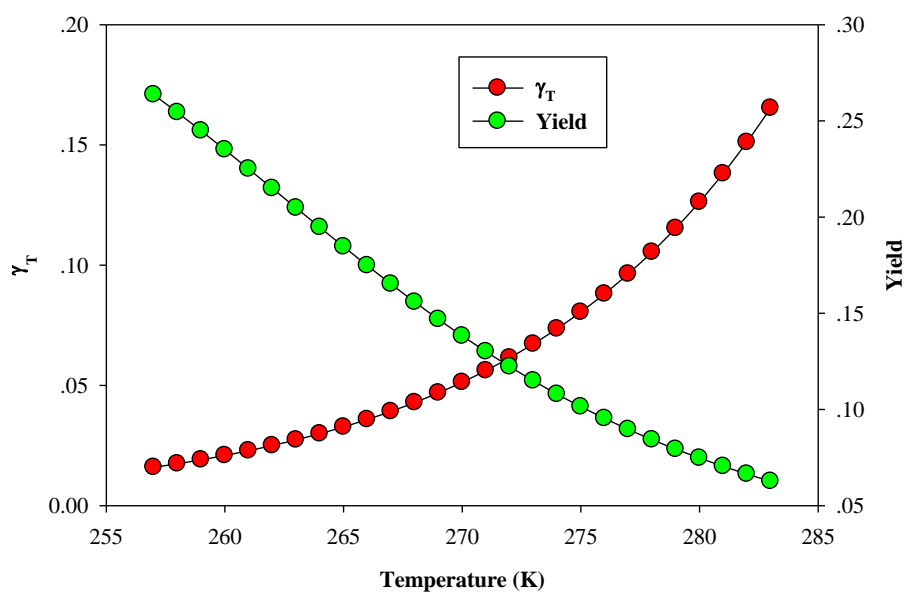


Figure S5 Temperature dependence of  $\alpha$ -pinene emission rate ( $\gamma_T$ ) and SOA yield

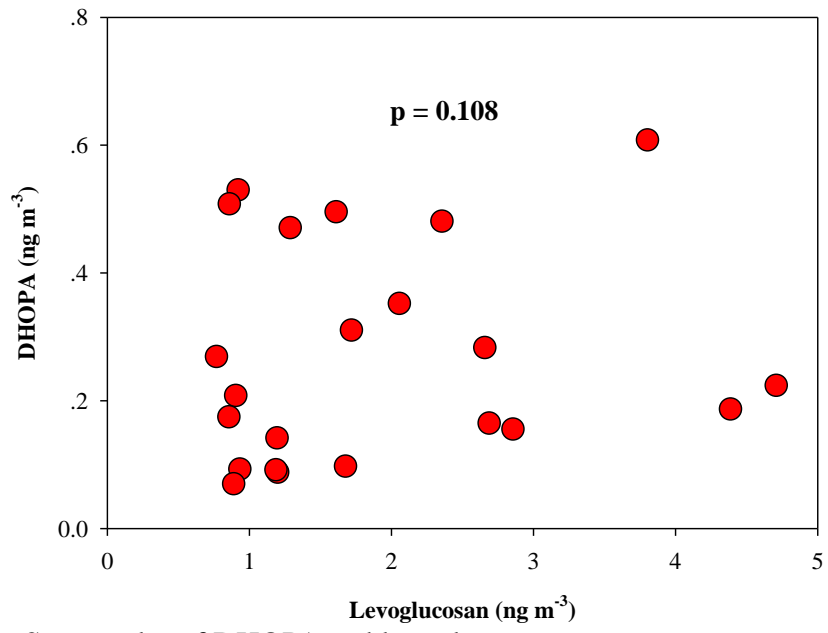


Figure S6 Scatter plot of DHOPA and levoglucosan

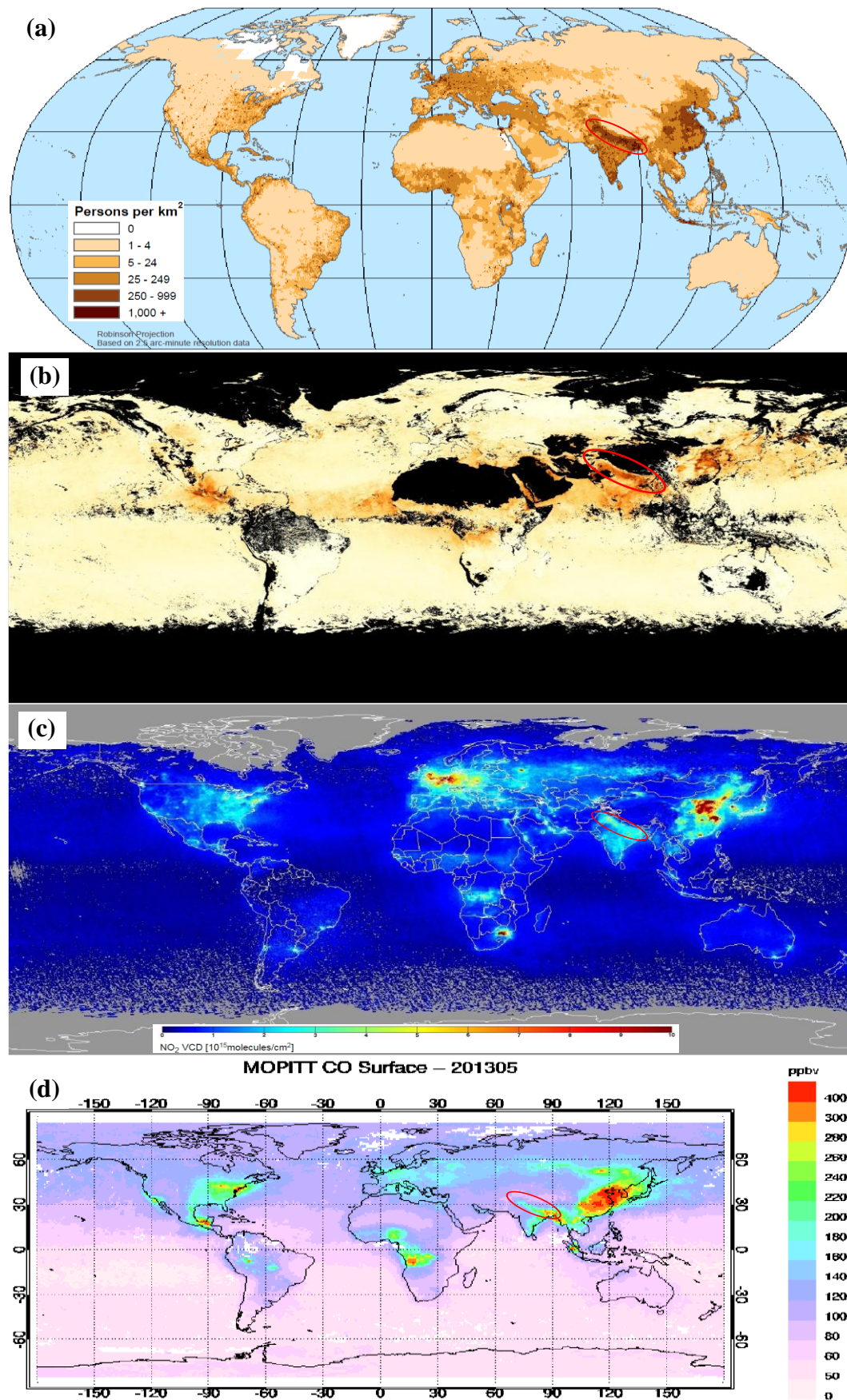


Figure S7 Global distribution of population density in 2000 (a), AOT (b), tropospheric NO<sub>2</sub> VCD (b), and surface CO (d) in May 2013. The area within the red circle is the northern India subcontinent.



Table S1 Estimation of measurement uncertainty

Tracers	Tracer formula	Surrogates	Surrogate formula	E <sub>Q</sub> (%)	E <sub>R</sub> (%) <sup>a</sup>	E <sub>A</sub> (%)
<i>cis</i> -Pinonic acid	C <sub>10</sub> H <sub>16</sub> O <sub>3</sub>	<i>cis</i> -Pinonic acid			1	
Pinic acid	C <sub>9</sub> H <sub>14</sub> O <sub>4</sub>	Pinic acid			30	
3-Methyl-1,2,3-butantricarboxylic acid	C <sub>8</sub> H <sub>12</sub> O <sub>6</sub>	<i>cis</i> -Pinonic acid	C <sub>10</sub> H <sub>16</sub> O <sub>3</sub>	60	1	60
3-Hydroxyglutaric acid	C <sub>5</sub> H <sub>8</sub> O <sub>5</sub>	<i>cis</i> -Pinonic acid	C <sub>10</sub> H <sub>16</sub> O <sub>3</sub>	95	1	95
3-Hydroxy-4,4-dimethylglutaric acid	C <sub>7</sub> H <sub>12</sub> O <sub>5</sub>	<i>cis</i> -Pinonic acid	C <sub>10</sub> H <sub>16</sub> O <sub>3</sub>	65	1	65
<i>cis</i> -2-Methyl-1,3,4-trihydroxy-1-butene	C <sub>5</sub> H <sub>10</sub> O <sub>3</sub>	Erythritol	C <sub>4</sub> H <sub>10</sub> O <sub>4</sub>	85	35	92
3-Methyl-2,3,4-trihydroxy-1-butene	C <sub>5</sub> H <sub>10</sub> O <sub>3</sub>	Erythritol	C <sub>4</sub> H <sub>10</sub> O <sub>4</sub>	85	35	92
<i>trans</i> -2-Methyl-1,3,4-trihydroxy-1-butene	C <sub>5</sub> H <sub>10</sub> O <sub>3</sub>	Erythritol	C <sub>4</sub> H <sub>10</sub> O <sub>4</sub>	85	35	92
2-Methylglyceric acid	C <sub>4</sub> H <sub>8</sub> O <sub>4</sub>	Erythritol	C <sub>4</sub> H <sub>10</sub> O <sub>4</sub>	20	35	40
2-Methylthreitol	C <sub>5</sub> H <sub>12</sub> O <sub>4</sub>	Erythritol	C <sub>4</sub> H <sub>10</sub> O <sub>4</sub>	15	35	38
2-Methylerythritol	C <sub>5</sub> H <sub>12</sub> O <sub>4</sub>	Erythritol	C <sub>4</sub> H <sub>10</sub> O <sub>4</sub>	15	35	38
β-Caryophyllenic acid	C <sub>13</sub> H <sub>20</sub> O <sub>4</sub>	Octadecanoic acid	C <sub>18</sub> H <sub>36</sub> O <sub>2</sub>	155	17	156
2,3-Dihydroxy-4-oxopentanoic acid	C <sub>5</sub> H <sub>8</sub> O <sub>5</sub>	Azelaic acid	C <sub>9</sub> H <sub>16</sub> O <sub>4</sub>	90	11	91

<sup>a</sup> E<sub>R</sub> is the difference between 100% and mean recovery of each surrogate standard.

Table S2 Two-product model parameters for  $\alpha$ -pinene SOA

$\alpha_1$	0.038
$\alpha_2$	0.326
$K_1^*$ (mg/ $\mu$ g)	0.171
$K_2^*$ (mg/ $\mu$ g)	0.004
$T^*$ (K)	308
$H_1=H_2$ (kcal/mol)	17.5
$R$ (J/K mol)	8.314

Data used by Sheehan and Bowman (2001)

## Reference

Sheehan, P. E., and Bowman, F. M.: Estimated effects of temperature on secondary organic aerosol concentrations, *Environ. Sci. Technol.*, 35, 2129-2135, 2001.