

Supplement of Biogeosciences Discuss., 11, 13533–13570, 2014  
<http://www.biogeosciences-discuss.net/11/13533/2014/>  
doi:10.5194/bgd-11-13533-2014-supplement  
© Author(s) 2014. CC Attribution 3.0 License.



*Supplement of*

## **Quantifying environmental stress induced emissions of algal isoprene and monoterpenes using laboratory measurements**

**N. Meskhidze et al.**

*Correspondence to:* N. Meskhidze (nmeskhidze@ncsu.edu)

## Auxiliary Material for

### Quantifying Marine Emissions of Isoprene and Monoterpenes Using Laboratory Measurements

Nicholas Meskhidze, Alyssa Sabolis, Robert Reed, and Daniel Kamykowski

**Table S1.** Purge and Trap Conditions

<b>CDS 8000</b>	
Sample Purge	40 ml/min for 35 min
Desorb	250°C for 5 min
Bake	260°C for 5 min
Temperatures	Line 250°C, Valve 260°C, Wet trap 200°C
<b>GC Parameters</b>	
Oven Temp	50°C for 2 minute hold
Temperature Ramp	From 50°C to 250°C at 6°C/min
Column	CP-PoraBOND PLOT Q Fused Silica
Injector	Split, 250°C
Split ratio	10:1 for 0.75 min, 100:1 for 2.25 min, 20:1 till end
Carrier Gas	Ultra High Purity Helium
<b>MS Parameters</b>	
Scan Time	3 $\mu$ scans @ 0.45 seconds/scan
Ionization Mode	Electron Ionization (EI)
Emission Current	20 $\mu$ amps
Mass Range	35-300 m/z
Delay*	5 min
GC/MS Transfer Line Temperature	180°C
Ion Trap Temperature	180°C

\*Delay set to avoid "dead volume" signal in chromatograph

**Table S2.** Isoprene production rates from phytoplankton monocultures as a function of time

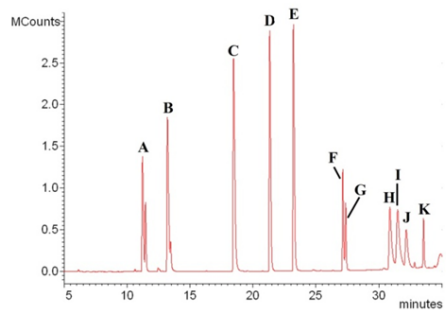
<i>T. weissflogii</i>											
		Day 1					Day 2				
Hours of exposition (h)		2	4.5	7	9.5	12	2	4.5	7	9.5	12
Isoprene x 10 <sup>20</sup> moles (cell) <sup>-1</sup> h <sup>-1</sup>	900 μmol m <sup>-2</sup> s <sup>-1</sup>	2.68	20.59	13.75	9.99	10.29	14.03	17.00	14.46	15.39	15.62
	420 μmol m <sup>-2</sup> s <sup>-1</sup>	6.93	25.99	19.48	10.84	11.10	11.81	14.72	14.51	14.12	13.38
	150 μmol m <sup>-2</sup> s <sup>-1</sup>	6.59	15.52	14.99	13.06	11.55	7.45	11.25	10.14	9.37	11.23
	90 μmol m <sup>-2</sup> s <sup>-1</sup>	0.92	3.75	4.61	3.55	3.09	5.52	7.27	6.62	6.24	6.36
Isoprene μgram (g Chl- <i>a</i> ) <sup>-1</sup> h <sup>-1</sup>	900 μmol m <sup>-2</sup> s <sup>-1</sup>	4.02	30.84	20.60	14.96	15.42	22.18	26.87	22.86	24.32	24.68
	420 μmol m <sup>-2</sup> s <sup>-1</sup>	8.40	31.50	23.61	13.14	13.45	17.61	21.95	21.63	21.06	19.96
	150 μmol m <sup>-2</sup> s <sup>-1</sup>	7.33	17.27	16.67	14.53	12.85	10.22	15.43	13.92	12.86	15.41
	90 μmol m <sup>-2</sup> s <sup>-1</sup>	2.03	8.26	10.16	7.82	6.81	6.61	8.71	7.94	7.48	7.62
<i>T. pseudonana</i>											
		Day 1					Day 2				
Hours of exposition (h)		2	4.5	7	9.5	12	2	4.5	7	9.5	12
Isoprene x 10 <sup>20</sup> moles (cell) <sup>-1</sup> h <sup>-1</sup>	900 μmol m <sup>-2</sup> s <sup>-1</sup>	2.81	21.57	13.47	9.00	7.73	14.65	17.75	18.12	12.85	13.11
	420 μmol m <sup>-2</sup> s <sup>-1</sup>	4.64	18.69	11.71	7.25	8.54	13.86	16.78	16.54	15.05	14.26
	150 μmol m <sup>-2</sup> s <sup>-1</sup>	3.51	8.27	9.98	9.57	8.46	14.53	13.29	12.68	11.92	10.59
	90 μmol m <sup>-2</sup> s <sup>-1</sup>	2.05	6.30	10.78	7.39	7.23	8.25	9.62	7.72	7.37	6.55
Isoprene μgram (g Chl- <i>a</i> ) <sup>-1</sup> h <sup>-1</sup>	900 μmol m <sup>-2</sup> s <sup>-1</sup>	4.53	34.73	21.68	14.48	12.44	23.40	28.35	28.95	20.53	20.94
	420 μmol m <sup>-2</sup> s <sup>-1</sup>	7.15	28.79	18.05	11.17	13.16	20.85	25.25	24.88	22.65	21.46
	150 μmol m <sup>-2</sup> s <sup>-1</sup>	5.20	12.25	14.78	14.16	12.52	22.07	20.19	19.27	18.10	16.09
	90 μmol m <sup>-2</sup> s <sup>-1</sup>	2.55	7.81	13.36	9.16	8.96	10.34	12.06	9.68	9.24	8.21
<i>P. carterae</i>											
		Day 1					Day 2				
Hours of exposition (h)		2	4.5	7	9.5	12	2	4.5	7	9.5	12
Isoprene x 10 <sup>20</sup> moles (cell) <sup>-1</sup> h <sup>-1</sup>	900 μmol m <sup>-2</sup> s <sup>-1</sup>	5.77	8.81	3.44	2.54	2.82	6.05	5.78	6.44	5.82	5.59
	420 μmol m <sup>-2</sup> s <sup>-1</sup>	5.73	7.90	3.28	2.73	2.67	5.58	5.27	5.02	3.61	4.10
	150 μmol m <sup>-2</sup> s <sup>-1</sup>	5.29	5.58	2.69	2.37	2.57	3.98	4.82	5.32	2.28	2.86
	90 μmol m <sup>-2</sup> s <sup>-1</sup>	3.04	3.12	2.67	1.75	1.73	1.75	2.43	2.89	2.71	2.58
Isoprene μgram (g Chl- <i>a</i> ) <sup>-1</sup> h <sup>-1</sup>	900 μmol m <sup>-2</sup> s <sup>-1</sup>	8.47	12.92	5.04	3.72	4.14	5.02	4.79	5.34	4.83	4.64
	420 μmol m <sup>-2</sup> s <sup>-1</sup>	8.27	11.40	4.73	3.93	3.86	8.45	7.98	7.60	5.46	6.21
	150 μmol m <sup>-2</sup> s <sup>-1</sup>	7.65	8.08	3.89	3.43	3.72	5.81	7.04	7.77	3.33	4.17
	90 μmol m <sup>-2</sup> s <sup>-1</sup>	6.11	6.27	5.36	3.51	3.48	3.27	4.54	5.41	5.07	4.82

<i>R. salina</i>											
		Day 1					Day 2				
Hours of exposition (h)		2	4.5	7	9.5	12	2	4.5	7	9.5	12
Isoprene x 10 <sup>20</sup> moles (cell) <sup>-1</sup> h <sup>-1</sup>	900 μmol m <sup>-2</sup> s <sup>-1</sup>	8.89	12.09	5.42	4.07	4.04	5.00	8.60	8.44	8.63	9.14
	420 μmol m <sup>-2</sup> s <sup>-1</sup>	9.80	13.21	4.36	4.22	4.57	3.73	6.35	5.56	6.52	6.82
	150 μmol m <sup>-2</sup> s <sup>-1</sup>	5.88	7.48	3.86	4.25	4.34	4.84	4.50	4.64	3.97	3.83
	90 μmol m <sup>-2</sup> s <sup>-1</sup>	4.93	4.75	3.13	3.48	4.41	4.01	4.52	3.30	3.28	3.75
Isoprene μgram (g Chl- <i>a</i> ) <sup>-1</sup> h <sup>-1</sup>	900 μmol m <sup>-2</sup> s <sup>-1</sup>	5.00	8.60	8.44	8.63	9.14	5.80	9.97	9.78	10.00	10.60
	420 μmol m <sup>-2</sup> s <sup>-1</sup>	3.73	6.35	5.56	6.52	6.82	4.70	8.00	7.01	8.22	8.60
	150 μmol m <sup>-2</sup> s <sup>-1</sup>	4.84	4.50	4.64	3.97	3.83	6.62	6.16	6.34	5.43	5.24
	90 μmol m <sup>-2</sup> s <sup>-1</sup>	4.01	4.52	3.30	3.28	3.75	5.57	6.27	4.59	4.55	5.21
<i>P. minimum</i>											
		Day 1					Day 2				
Hours of exposition (h)		2	4.5	7	9.5	12	2	4.5	7	9.5	12
Isoprene x 10 <sup>20</sup> moles (cell) <sup>-1</sup> h <sup>-1</sup>	900 μmol m <sup>-2</sup> s <sup>-1</sup>	8.41	8.97	9.18	6.41	7.07	9.76	8.22	8.33	8.44	8.14
	420 μmol m <sup>-2</sup> s <sup>-1</sup>	13.01	12.01	8.47	6.26	5.76	14.82	9.09	12.31	12.28	9.75
	150 μmol m <sup>-2</sup> s <sup>-1</sup>	8.07	7.29	6.82	4.97	5.30	6.76	8.40	10.14	10.52	10.13
	90 μmol m <sup>-2</sup> s <sup>-1</sup>	2.73	5.17	4.99	2.68	3.18	4.54	3.18	3.71	3.54	4.03
Isoprene μgram (g Chl- <i>a</i> ) <sup>-1</sup> h <sup>-1</sup>	900 μmol m <sup>-2</sup> s <sup>-1</sup>	12.86	13.71	14.03	9.79	10.80	9.31	7.84	7.94	8.05	7.76
	420 μmol m <sup>-2</sup> s <sup>-1</sup>	15.29	14.12	9.96	7.36	6.77	18.70	11.47	15.54	15.50	12.30
	150 μmol m <sup>-2</sup> s <sup>-1</sup>	11.24	10.15	9.49	6.92	7.38	8.79	10.92	13.19	13.69	13.18
	90 μmol m <sup>-2</sup> s <sup>-1</sup>	4.10	7.77	7.50	4.03	4.77	7.16	5.02	5.86	5.58	6.35
<i>K. brevis</i>											
		Day 1					Day 2				
Hours of exposition (h)		2	4.5	7	9.5	12	2	4.5	7	9.5	12
Isoprene x 10 <sup>20</sup> moles (cell) <sup>-1</sup> h <sup>-1</sup>	900 μmol m <sup>-2</sup> s <sup>-1</sup>	5.56	4.89	3.42	3.36	3.19	2.06	4.27	6.34	4.27	4.23
	420 μmol m <sup>-2</sup> s <sup>-1</sup>	8.50	6.83	3.87	2.27	2.30	7.47	7.81	5.47	5.98	5.11
	150 μmol m <sup>-2</sup> s <sup>-1</sup>	5.53	2.70	3.91	3.63	3.79	7.41	6.33	3.59	4.30	4.03
	90 μmol m <sup>-2</sup> s <sup>-1</sup>	4.84	4.27	3.16	2.90	2.84	3.75	4.11	3.90	3.70	3.52
Isoprene μgram (g Chl- <i>a</i> ) <sup>-1</sup> h <sup>-1</sup>	900 μmol m <sup>-2</sup> s <sup>-1</sup>	8.62	7.60	5.31	5.21	4.96	2.84	5.87	8.72	5.87	5.82
	420 μmol m <sup>-2</sup> s <sup>-1</sup>	10.31	8.29	4.70	2.76	2.79	9.47	9.90	6.93	7.58	6.48
	150 μmol m <sup>-2</sup> s <sup>-1</sup>	8.19	3.99	5.79	5.38	5.62	12.35	10.55	5.99	7.17	6.71
	90 μmol m <sup>-2</sup> s <sup>-1</sup>	7.27	6.42	4.75	4.36	4.28	5.61	6.15	5.84	5.55	5.27

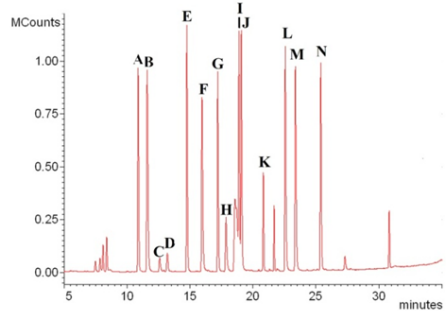
**Table S3.**  $\alpha$ -Pinene production rates from phytoplankton monocultures as a function of time

<i>T. weissflogii</i>											
		Day 1					Day 2				
Hours of exposition (h)		2	4.5	7	9.5	12	2	4.5	7	9.5	12
$\alpha$ -Pinene x 10 <sup>21</sup> moles (cell) <sup>-1</sup> h <sup>-1</sup>	900 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.58	3.30	1.38	1.25	1.22	1.00	1.60	1.30	1.45	1.32
	420 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.47	3.76	3.15	2.06	2.08	0.78	1.33	1.42	0.81	0.93
	150 $\mu\text{mol m}^{-2} \text{s}^{-1}$	1.02	3.09	1.86	1.43	1.23	0.75	0.92	1.18	0.91	1.09
	90 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.32	0.28	0.31	0.31	0.27	0.58	0.56	0.71	0.68	0.82
$\alpha$ -Pinene $\mu\text{gram (g Chl-}a\text{)}^{-1} \text{h}^{-1}$	900 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.17	0.99	0.41	0.38	0.37	0.30	0.49	0.40	0.44	0.40
	420 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.11	0.91	0.76	0.50	0.50	0.22	0.38	0.41	0.24	0.27
	150 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.23	0.69	0.41	0.32	0.27	0.21	0.25	0.33	0.25	0.30
	90 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.14	0.12	0.14	0.14	0.12	0.14	0.13	0.17	0.16	0.20
<i>T. pseudonana</i>											
		Day 1					Day 2				
Hours of exposition (h)		2	4.5	7	9.5	12	2	4.5	7	9.5	12
$\alpha$ -Pinene x 10 <sup>21</sup> moles (cell) <sup>-1</sup> h <sup>-1</sup>	900 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.73	2.29	3.24	1.41	0.89	0.69	0.99	1.79	3.17	3.24
	420 $\mu\text{mol m}^{-2} \text{s}^{-1}$	1.13	2.47	3.24	0.99	1.38	0.92	2.29	2.35	3.13	3.20
	150 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.65	1.74	1.65	1.23	0.77	1.36	1.71	2.35	3.12	3.18
	90 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.82	0.92	0.85	0.95	0.88	1.05	1.11	0.96	1.05	0.73
$\alpha$ -Pinene $\mu\text{gram (g Chl-}a\text{)}^{-1} \text{h}^{-1}$	900 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.24	0.74	1.04	0.45	0.29	0.19	0.27	0.50	0.88	0.90
	420 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.35	0.76	1.00	0.30	0.42	0.25	0.61	0.63	0.84	0.86
	150 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.19	0.51	0.48	0.36	0.22	0.36	0.45	0.62	0.82	0.84
	90 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.20	0.23	0.21	0.24	0.22	0.26	0.28	0.24	0.26	0.18
<i>P. carterae</i>											
		Day 1					Day 2				
Hours of exposition (h)		2	4.5	7	9.5	12	2	4.5	7	9.5	12
$\alpha$ -Pinene x 10 <sup>21</sup> moles (cell) <sup>-1</sup> h <sup>-1</sup>	900 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.81	1.24	1.14	0.85	0.94	0.55	0.57	1.02	1.30	1.21
	420 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.99	0.98	1.10	0.96	0.92	0.16	0.58	1.08	1.53	1.60
	150 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.79	0.88	0.71	0.80	0.84	0.38	0.63	0.33	1.87	1.82
	90 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.28	0.51	0.43	0.51	0.31	0.27	0.33	0.40	0.37	0.36
$\alpha$ -Pinene $\mu\text{gram (g Chl-}a\text{)}^{-1} \text{h}^{-1}$	900 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.24	0.36	0.33	0.25	0.27	0.15	0.15	0.27	0.35	0.32
	420 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.28	0.28	0.32	0.27	0.27	0.04	0.14	0.26	0.37	0.38
	150 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.23	0.26	0.21	0.23	0.24	0.10	0.16	0.08	0.47	0.46
	90 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.11	0.21	0.17	0.20	0.12	0.10	0.13	0.15	0.14	0.14
<i>R. salina</i>											
		Day 1					Day 2				
Hours of exposition (h)		2	4.5	7	9.5	12	2	4.5	7	9.5	12

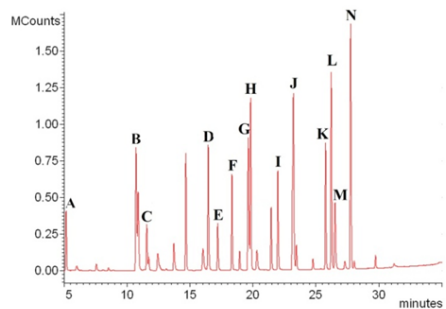
$\alpha$ -Pinene x 10 <sup>21</sup> moles (cell) <sup>-1</sup> h <sup>-1</sup>	900 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.87	1.48	1.07	1.05	0.87	1.14	1.17	1.30	1.74	1.14
	420 $\mu\text{mol m}^{-2} \text{s}^{-1}$	1.31	1.68	1.78	1.87	1.31	1.10	0.85	1.23	1.32	1.10
	150 $\mu\text{mol m}^{-2} \text{s}^{-1}$	1.49	1.77	2.18	2.39	1.49	0.67	1.48	1.42	1.76	0.67
	90 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.89	0.78	1.28	1.57	0.89	0.76	0.85	0.74	1.22	0.76
$\alpha$ -Pinene $\mu\text{gram (g Chl-}a\text{)}^{-1}\text{h}^{-1}$	900 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.21	0.22	0.38	0.27	0.27	0.27	0.28	0.31	0.42	0.42
	420 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.26	0.36	0.46	0.49	0.52	0.29	0.23	0.33	0.35	0.48
	150 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.23	0.40	0.47	0.58	0.64	0.16	0.35	0.33	0.41	0.38
	90 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.26	0.24	0.21	0.35	0.43	0.20	0.22	0.19	0.32	0.35
<i>P. minimum</i>											
		<b>Day 1</b>					<b>Day 2</b>				
Hours of exposition (h)		<b>2</b>	<b>4.5</b>	<b>7</b>	<b>9.5</b>	<b>12</b>	<b>2</b>	<b>4.5</b>	<b>7</b>	<b>9.5</b>	<b>12</b>
$\alpha$ -Pinene x 10 <sup>21</sup> moles (cell) <sup>-1</sup> h <sup>-1</sup>	900 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.48	0.90	1.56	1.83	0.48	1.29	0.51	1.45	2.05	1.29
	420 $\mu\text{mol m}^{-2} \text{s}^{-1}$	1.64	1.34	1.59	2.10	1.64	2.44	0.64	0.80	1.32	2.44
	150 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.04	0.79	1.09	1.69	0.04	1.81	1.42	0.68	0.80	1.81
	90 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.38	0.75	0.55	0.64	0.38	0.96	0.63	1.03	0.59	0.96
$\alpha$ -Pinene $\mu\text{gram (g Chl-}a\text{)}^{-1}\text{h}^{-1}$	900 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.15	0.28	0.48	0.56	0.54	0.28	0.11	0.31	0.44	0.35
	420 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.38	0.31	0.37	0.49	0.43	1.03	0.27	0.34	0.56	0.51
	150 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.01	0.22	0.30	0.47	0.46	0.60	0.47	0.23	0.27	0.26
	90 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.13	0.25	0.18	0.22	0.24	0.30	0.20	0.33	0.19	0.23
<i>K. brevis</i>											
		<b>Day 1</b>					<b>Day 2</b>				
Hours of exposition (h)		<b>2</b>	<b>4.5</b>	<b>7</b>	<b>9.5</b>	<b>12</b>	<b>2</b>	<b>4.5</b>	<b>7</b>	<b>9.5</b>	<b>12</b>
$\alpha$ -Pinene x 10 <sup>21</sup> moles (cell) <sup>-1</sup> h <sup>-1</sup>	900 $\mu\text{mol m}^{-2} \text{s}^{-1}$	1.68	1.97	2.02	2.05	1.68	0.31	2.32	1.38	1.94	0.31
	420 $\mu\text{mol m}^{-2} \text{s}^{-1}$	2.29	2.77	1.90	2.13	2.29	0.54	2.64	0.94	1.21	0.54
	150 $\mu\text{mol m}^{-2} \text{s}^{-1}$	2.03	1.69	1.52	0.72	2.03	1.10	2.29	0.45	0.54	1.10
	90 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.67	0.61	1.01	1.37	0.67	0.45	0.48	0.45	0.43	0.45
$\alpha$ -Pinene $\mu\text{gram (g Chl-}a\text{)}^{-1}\text{h}^{-1}$	900 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.52	0.61	0.63	0.64	0.60	0.10	0.71	0.42	0.60	0.54
	420 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.55	0.67	0.46	0.52	0.48	0.17	0.86	0.30	0.39	0.36
	150 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.60	0.50	0.45	0.21	0.24	0.33	0.70	0.14	0.16	0.16
	90 $\mu\text{mol m}^{-2} \text{s}^{-1}$	0.20	0.18	0.30	0.41	0.38	0.27	0.29	0.27	0.26	0.25



Compound
A Dimethyl sulfide
B Isoprene
C Benzene
D Dimethyl disulfide
E Toulene
F m-Xylene
G Ethylbenzene
H alpha-Pinene
I Camphene
J beta-Pinene
K D-Limonene

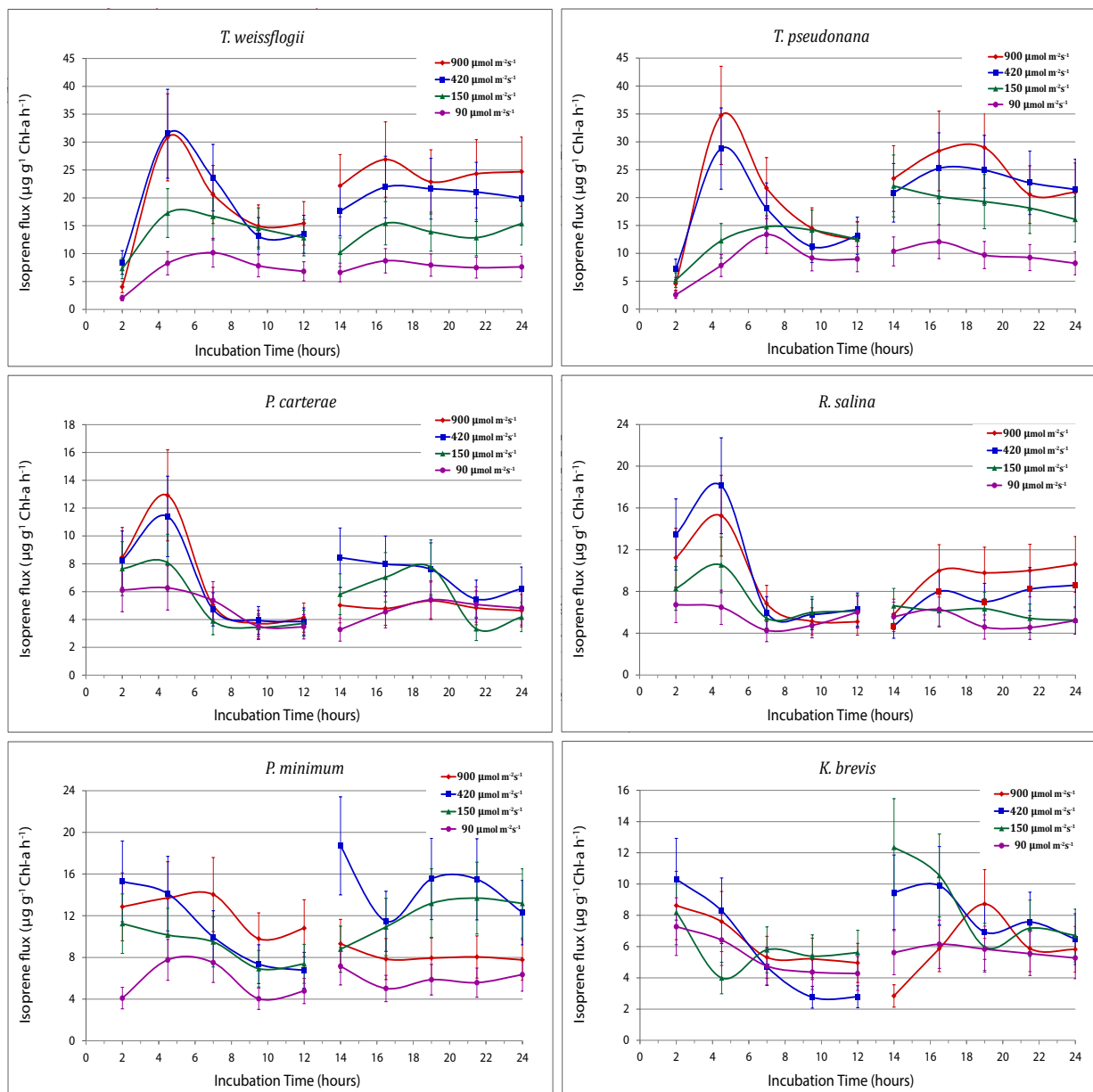


Compound
A Dichloromethane
B 1,2-Dichloroethane
C 1,1-Dichloroethane
D 2-Chloropropane
E 1,2-Dichloroethene
F Chloroform
G 1-Chlorobutane
H Carbon Tetrachloride
I Trichloroethene
J 1,1,1-Trichloroethane
K 1,3-Dichloropropene
L 1,1,2-Trichloroethane
M Tetrachloroethene
N Chlorobenzene



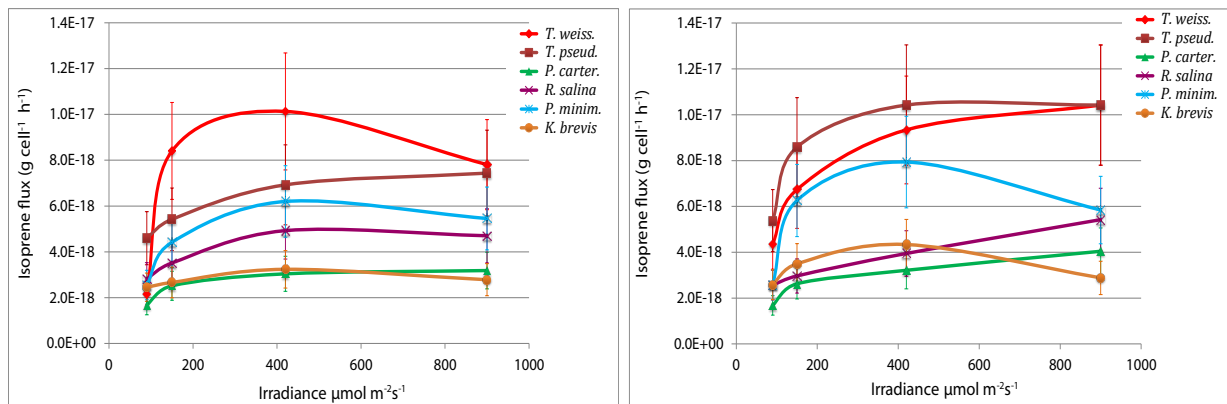
Compound
A Bromomethane
B Iodomethane
C 1-Bromoethane
D 1-Bromopropane
E Iodoethane
F Dibromomethane
G Bromodichloromethane
H Chloriodomethane
I 2-Iodopropane
J Dibromochloromethane
K 1-Bromopentane
L 1-Iodobutane
M Bromoform
N Diiodomethane

**Figure S1.** Sample chromatographs for 38 different BVOC screened. Each labeled spike corresponds to a listed compound on the right hand side.

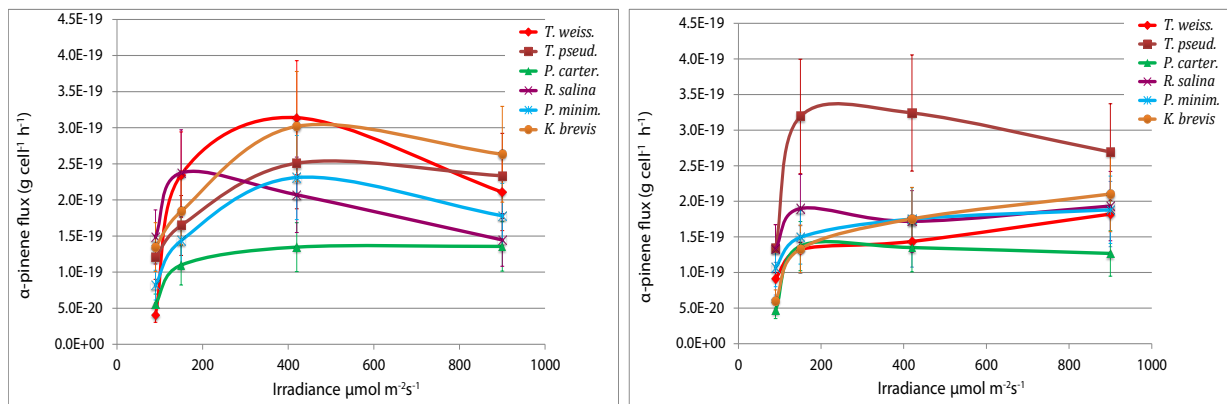


**Figure S2.** Light stress production rates for isoprene ( $\mu\text{g (g Chl-}a)^{-1} \text{ h}^{-1}$ ) as a function of time during the first (0 to 12 hours) and the second (12 to 24 hours) light cycle. Note that there was a 12-hour dark period between the two five point sample sets and that the first samples in each set were collected 2 hours after lights on. Error bars denote the  $\text{RSD}_{\text{Total}}$  value listed in Table 1.





**Figure S3.** The 12-hour averaged isoprene production rates ( $\text{g cell}^{-1} \text{h}^{-1}$ ) for the first (left column) and second (right column) light cycle as a function of irradiance. Error bars denote the  $\text{RSD}_{\text{Total}}$  value listed in Table 1.



**Figure S4.** The 12-hour averaged  $\alpha$ -pinene production rates (g cell<sup>-1</sup> h<sup>-1</sup>) for the first (left column) and second (right column) light cycle as a function of irradiance. Error bars denote the RSD<sub>Total</sub> value listed in Table 1.