



*Supplement of*

## **Biogeochemical and plant trait mechanisms drive enhanced methane emissions in response to whole-ecosystem warming**

**Genevieve L. Noyce and J. Patrick Megonigal**

*Correspondence to:* Genevieve L. Noyce (noyceg@si.edu)

The copyright of individual parts of the supplement might differ from the article licence.

Table S1. Calculated limit of detection ( $\text{LOD}_{\text{flux}}$ ) of chamber flux system.

# of stacked chambers	$\text{LOD}_{\text{flux}}$ ( $\mu\text{mol CH}_4 \text{ m}^{-2} \text{ d}^{-1}$ )
1	8.7
2	17.4
3	26.1
4	34.9

Table S2. Estimated annual CH<sub>4</sub> flux for each plot in 2017, 2108, and 2019.

Plot	Temperature Treatment	Plant Community	Replicate Transect	Estimated Annual CH <sub>4</sub> Flux (mmol CH <sub>4</sub> m <sup>-2</sup> yr <sup>-1</sup> )			Mean (SE) Annual CH <sub>4</sub> Flux (mmol CH <sub>4</sub> m <sup>-2</sup> yr <sup>-1</sup> )		
				2017	2018	2019	2017	2018	2019
310	Ambient	C <sub>3</sub>	1	59.9	125.5	83.7	58.4 (6.9)	161.4 (37.0)	80.4 (11.4)
320			2	69.6	235.4	98.3			
330			3	45.8	123.2	59.1			
311	+1.7 °C	C <sub>3</sub>	1	58.8	186.6	82.8	69.2 (21.8)	189.2 (23.0)	82.1 (6.5)
321			2	111.0	230.2	93.0			
331			3	37.8	150.9	70.6			
312	+3.4 °C	C <sub>3</sub>	1	87.5	160.5	113.6	82.6 (12.2)	178.8 (21.5)	90.7 (13.4)
322			2	100.9	221.7	67.2			
332			3	59.5	154.1	91.2			
313	+5.1 °C	C <sub>3</sub>	1	334.4	621.9	665.1	178.0 (78.2)	343.2 (140.0)	317.6 (174.5)
323			2	101.4	180.1	115.6			
333			3	98.3	227.6	172.1			
440	Ambient	C <sub>4</sub>	4	63.1	424.5	121.2	55.0 (6.9)	425.5 (88.6)	205.1 (45.2)
450			5	60.8	579.4	217.8			
460			6	41.2	272.4	276.3			
441	+1.7 °C	C <sub>4</sub>	4	37.6	298.4	154.9	61.7 (12.3)	370.9 (73.7)	417.6 (156.1)
451			5	69.7	518.3	695.0			
461			6	77.9	295.9	403.0			
442	+3.4 °C	C <sub>4</sub>	4	40.1	301.0	173.5	84.8 (24.5)	471.0 (96.9)	386.8 (127.6)
452			5	89.8	636.5	614.8			
462			6	124.5	475.3	371.9			
443	+5.1 °C	C <sub>4</sub>	4	84.3	288.8	127.7	157.8 (37.1)	879.3 (328.9)	469.9 (175.2)
453			5	185.2	1425.7	706.6			
463			6	203.8	923.3	575.5			



Figure S1. SMARTX plots in (a) the  $C_3$  community (dominated by *Schoenoplectus americanus*) and (b) the  $C_4$  community (dominated by *Spartina patens* and *Distichlis spicata*). Photos taken by G. Noyce.

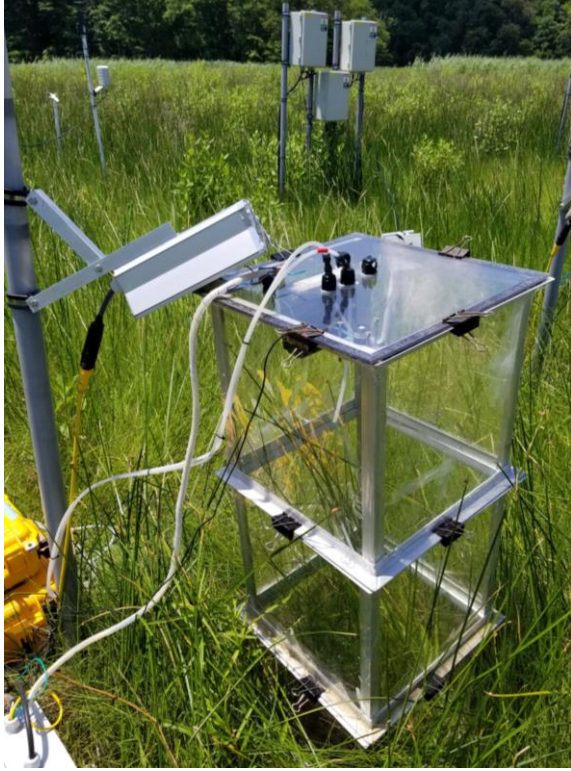


Figure S2. Stacked modular flux chambers. Photo taken by G. Noyce.

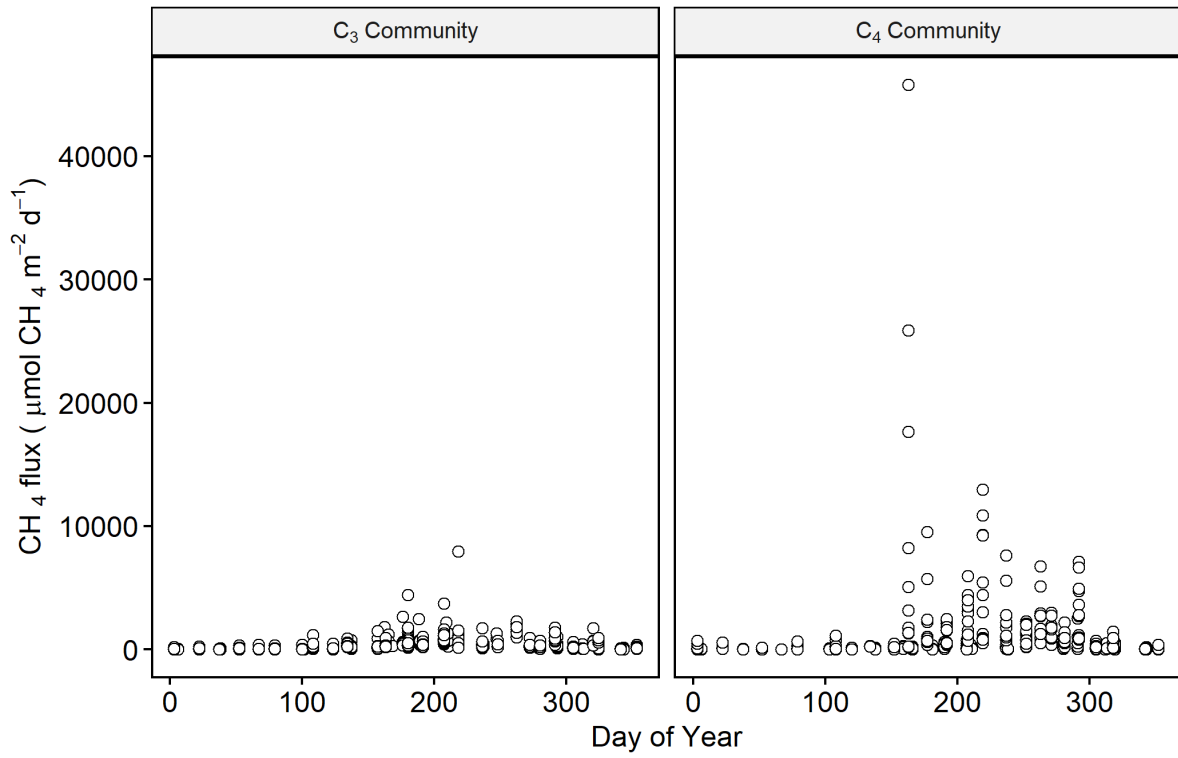


Figure S3. All raw CH<sub>4</sub> flux data.

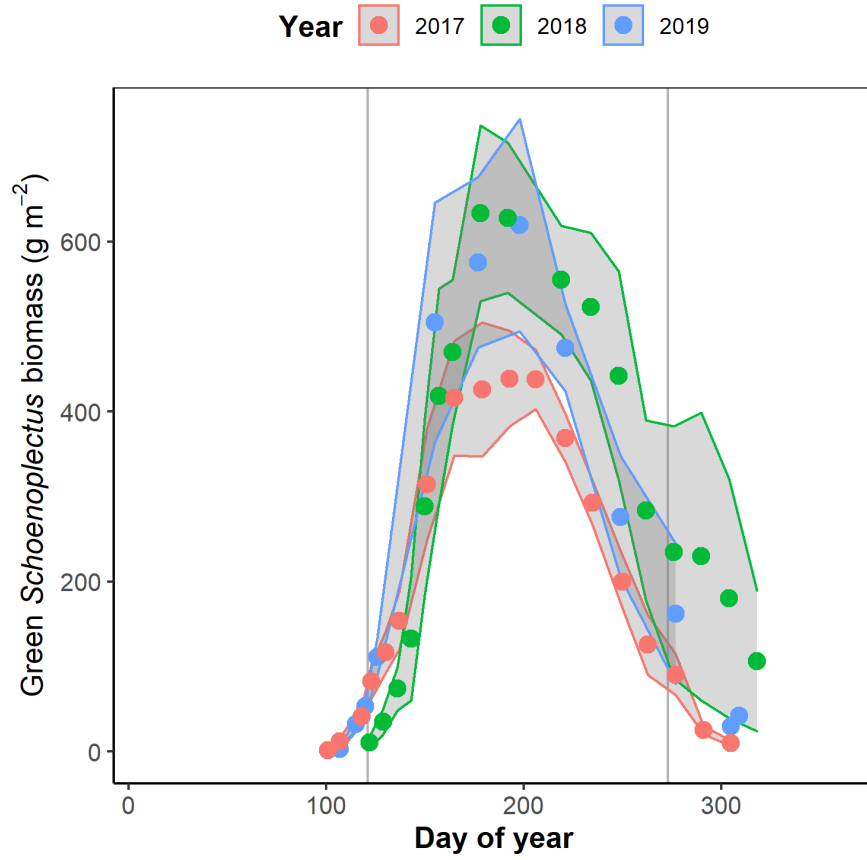


Figure S4. *Schoenoplectus* phenological data for 2017 – 2019 in ambient temperature plots. Points indicate means ( $n = 3$ ) and shaded area indicates SE. The vertical lines indicate the ‘growing season’, e.g. May 1 through Sep 30.

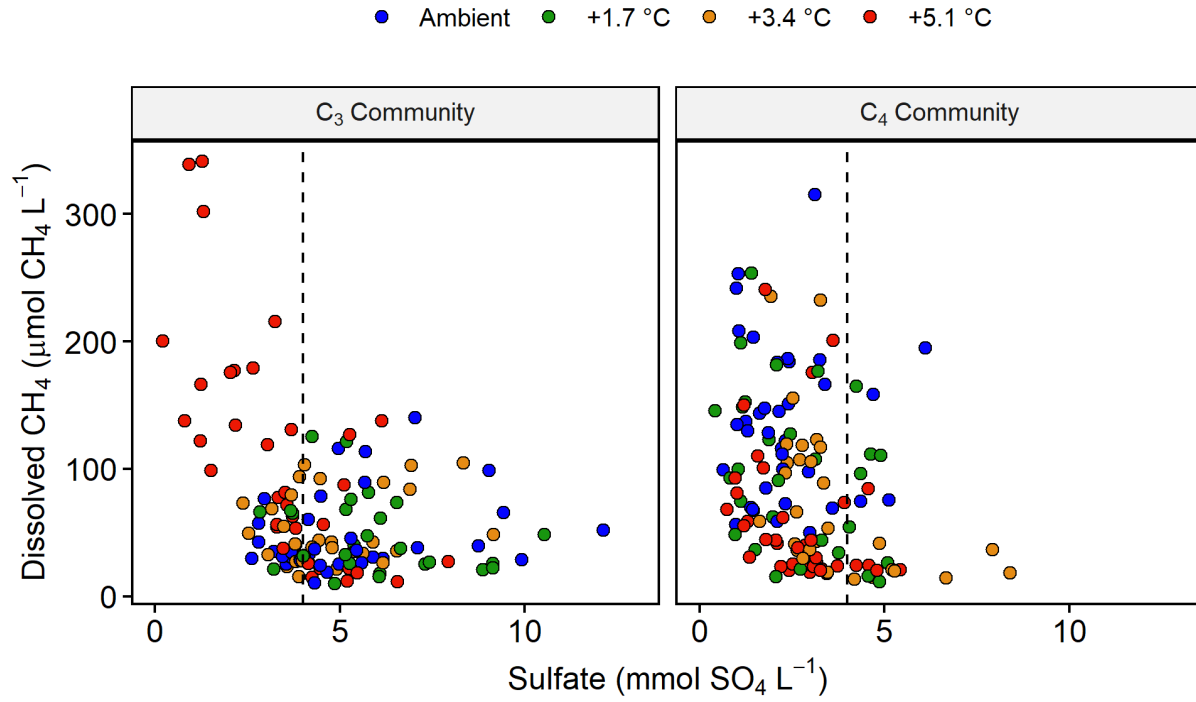


Figure S5. Mean concentrations of CH<sub>4</sub> and SO<sub>4</sub> for each plot and month that porewater was sampled. Colors indicate temperature treatment. The vertical dashed line indicates the 4 mm [SO<sub>4</sub>] threshold below which acetoclastic and hydrogenotrophic methanogenesis are released from substrate competition.

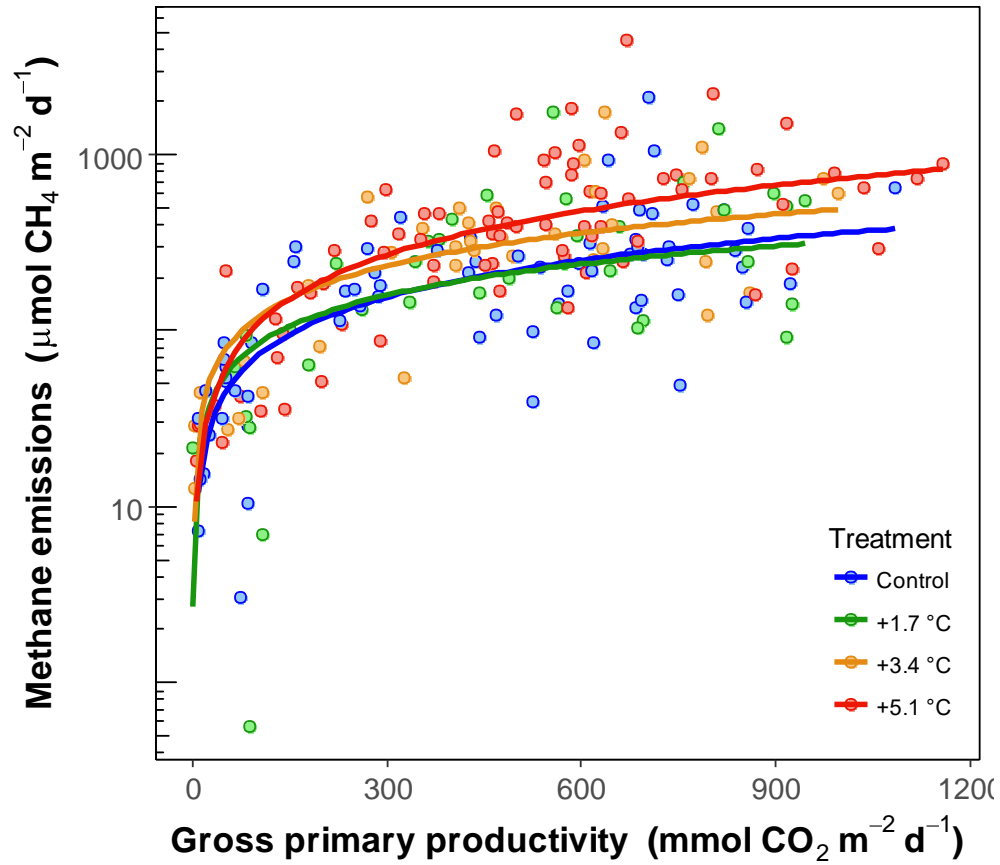


Figure S6. Methane emissions compared to gross primary productivity measured at the same time.  $\text{CH}_4$  emissions were strongly correlated with GPP.



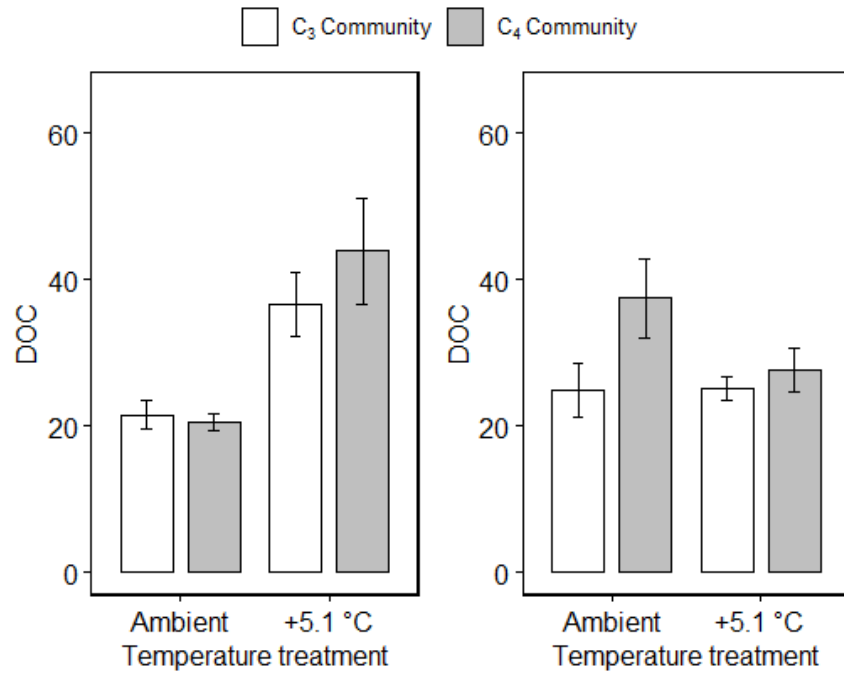


Figure S7. Comparison of DOC in July 2019 from the C<sub>3</sub> community dominated by *Schoenoplectus* (open bars) and the C<sub>4</sub> community dominated by *Spartina* and *Distichlis* (grey bars). Left: In the dominant rooting zone (10-20 cm); Right: below the rooting zone (40-120 cm). Error bars indicate SE.