

Supporting Information to: Organic matter and sediment properties determine in-lake variability of sediment CO₂ and CH₄ production and emissions of a small and shallow lake

Leandra Stephanie Emilia Praetzel, Nora Plenter, Sabrina Schilling, Marcel Schmiedeskamp, Gabriele

5 Broll, Klaus-Holger Knorr

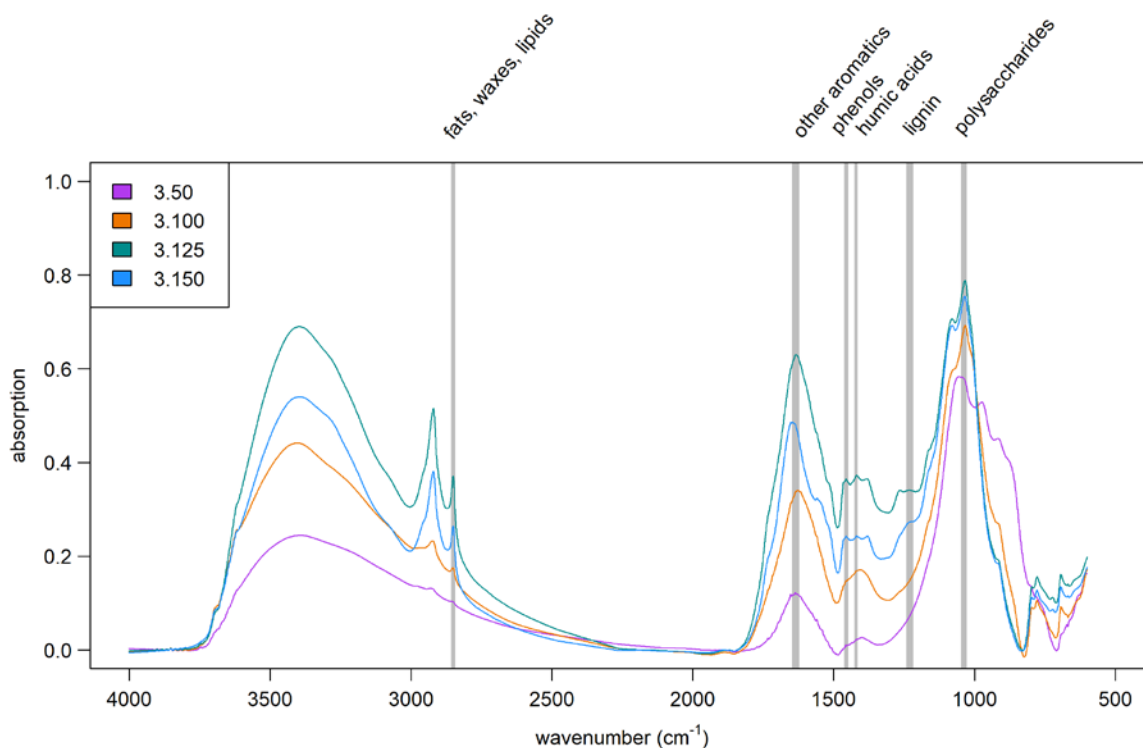


Figure S1: FTIR spectra of samples from transect 3.

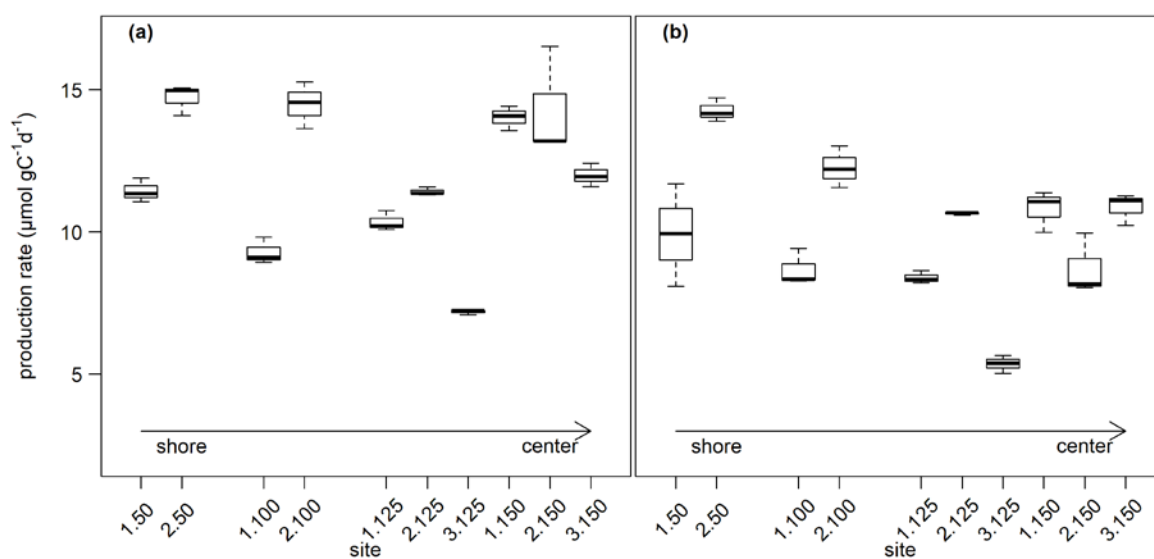
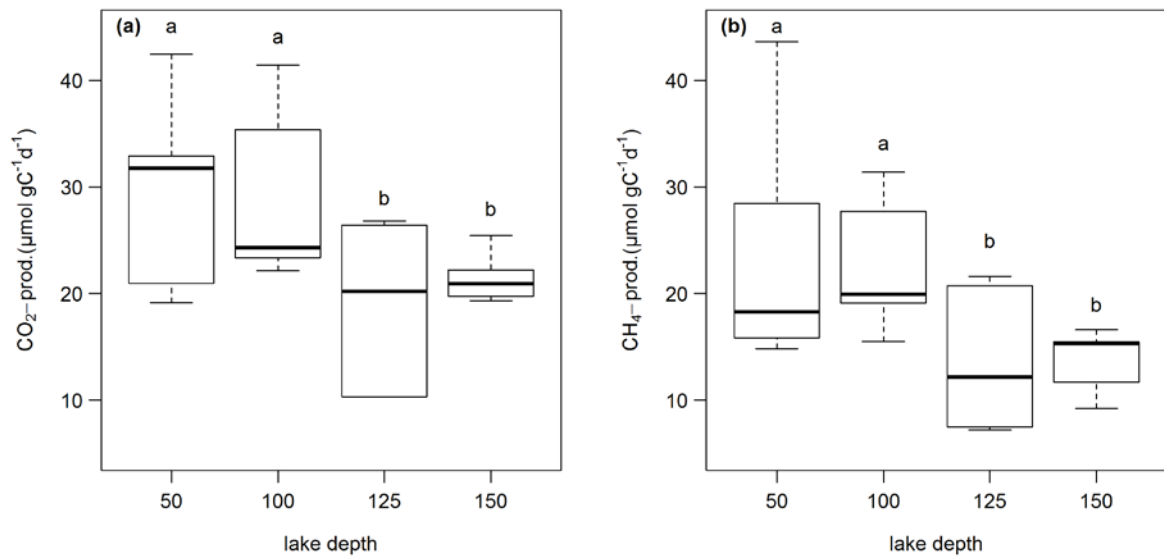
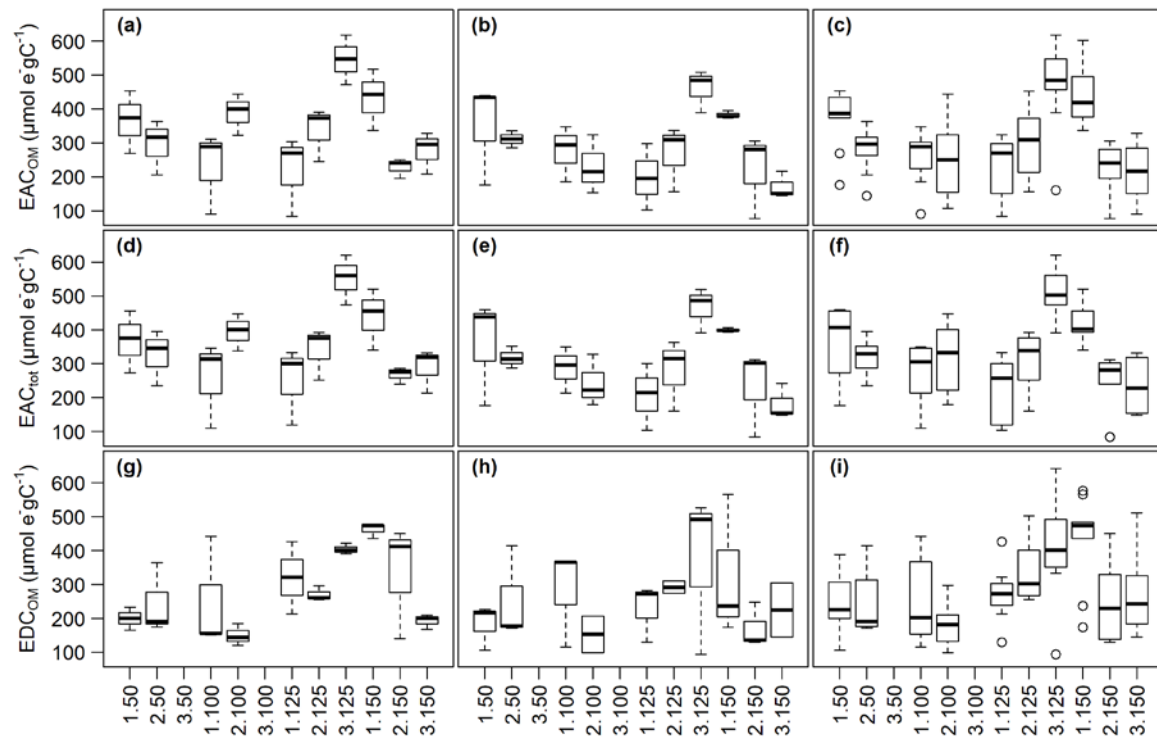


Figure S2: CO₂ (a) and CH₄ (b) production rates in 5-10 cm sediment depth. *n* = 3.



10

Figure S3: CO_2 (a) and CH_4 (b) production rates in the upper 5 cm of the sediment vs. lake depth. $n=12$. Different letters denote significant differences between groups.



15

Figure S4: Spatio-temporal variability of EAC_{OM} (a, b, c), EAC_{tot} (d, e, f) and EDC_{OM} (g, h, i) in the incubation experiment at the beginning (a, d, g, $n=3$), and the end (b, e, h, $n=3$) of the experiment as well as average values for the whole experiment (c, f, i, $n=6$).

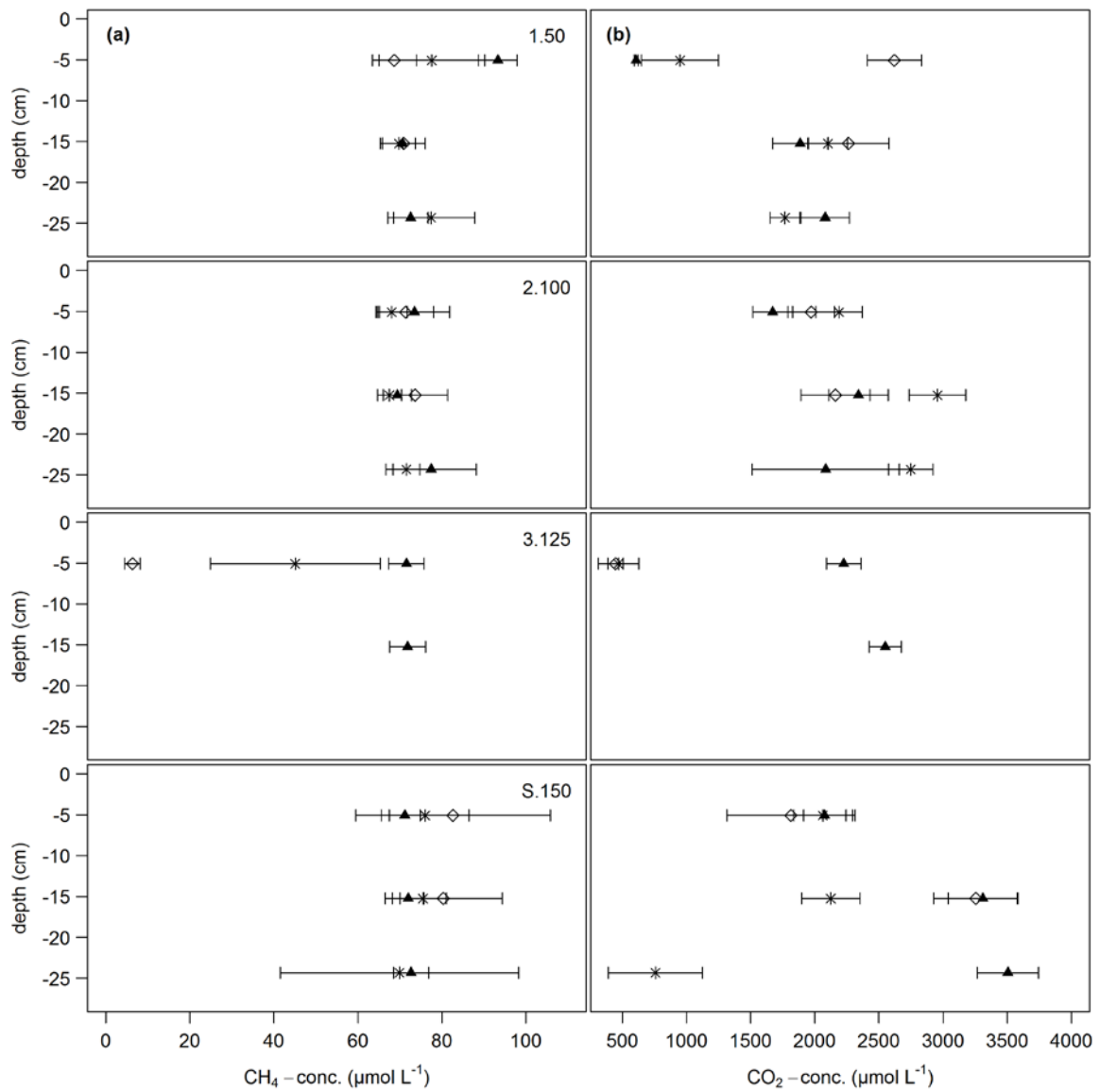


Figure S5: Depth profile of CH_4 (a) and CO_2 (b) concentration in the sediment of the mesocosms. Different symbols denote three replicates at each site. Values are means over sampling period \pm SD. $n = 2-10$

Table S1: Spearman's rank correlation coefficients and significance levels for CO₂ and CH₄ production, Q₁₀-values and EAC and EDC with all other measured parameters. n.s. means that correlations were not significant ($p > 0.05$). ACM = acetoclastic methanogenesis, HTM = hydrogenotrophic methanogenesis.

	CH ₄ production			CO ₂ production			Q ₁₀ (CH ₄)			EAC _{OM}			EAC _{tot}			EDC		
	<i>p</i>	<i>rho</i>	<i>n</i>	<i>p</i>	<i>rho</i>	<i>n</i>	<i>p</i>	<i>rho</i>	<i>n</i>	<i>p</i>	<i>rho</i>	<i>n</i>	<i>p</i>	<i>rho</i>	<i>n</i>	<i>p</i>	<i>rho</i>	<i>n</i>
aromatics	< 0.001	-0.669	22	< 0.01	-0.641	22	< 0.05	-0.821	7	n.s.	0.030	10	n.s.	0.042	10	n.s.	0.515	10
fats, waxes, lipids	< 0.001	-0.700	22	< 0.001	-0.736	22	< 0.05	-0.821	7	n.s.	0.321	10	n.s.	0.333	10	< 0.05	0.758	10
humic acids	< 0.01	-0.618	22	< 0.01	-0.653	22	< 0.05	-0.821	7	n.s.	0.067	10	n.s.	0.042	10	n.s.	0.455	10
lignin	< 0.01	-0.606	22	< 0.01	-0.610	22	< 0.05	-0.821	7	n.s.	0.031	10	n.s.	-0.006	10	n.s.	0.275	10
phenols	< 0.01	-0.606	22	< 0.001	-0.667	22	< 0.05	-0.821	7	n.s.	0.152	10	n.s.	0.115	10	n.s.	0.479	10
C	n.s.	-0.287	22	n.s.	-0.219	22	n.s.	-0.393	7	n.s.	-0.394	10	n.s.	-0.370	10	n.s.	-0.321	10
C/N	n.s.	-0.206	22	n.s.	-0.197	22	n.s.	-0.074	7	n.s.	-0.079	10	n.s.	-0.115	10	n.s.	-0.103	10
δ¹³C	n.s.	0.134	22	n.s.	0.091	22	n.s.	-0.321	7	n.s.	0.309	10	n.s.	0.224	10	n.s.	0.164	10
δ¹⁵N	n.s.	-0.267	22	n.s.	-0.281	22	n.s.	-0.071	7	n.s.	0.055	10	n.s.	-0.006	10	n.s.	-0.164	10
H₂ conc.	< 0.001	0.450	22	< 0.001	0.515	22				n.s.	-0.285	26	n.s.	-0.335	26	n.s.	-0.139	26
acetate conc.	n.s.	0.248	10	n.s.	0.455	10				< 0.01	-0.387	60	< 0.001	-0.418	60	n.s.	-0.035	60
HTM	< 0.01	-0.394	22	< 0.001	-0.516	22				< 0.05	0.426	26	< 0.05	0.426	26	n.s.	0.162	26
ACM	n.s.	0.491	10	n.s.	0.297	10				n.s.	0.042	60	n.s.	0.042	60	n.s.	-0.208	60
EAC_{OM}	n.s.	0.030	10	n.s.	-0.261	10												
EAC_{inorg}	n.s.	-0.261	10	n.s.	0.152	10												
EAC_{tot}	n.s.	-0.042	10	n.s.	-0.285	10												
EDC	< 0.05	-0.697	10	< 0.05	-0.673	10												
EAC/EDC	n.s.	0.406	10	n.s.	0.297	10												
EEC	n.s.	-0.479	10	n.s.	-0.636	10												
S	n.s.	-0.411	16	< 0.05	-0.446	16												
P	n.s.	0.282	22	n.s.	0.305	22												
Fe	n.s.	0.338	22	< 0.05	0.453	22												
Mn	n.s.	0.020	22	n.s.	0.121	22												
CO₂ conc.										n.s.	-0.161	20	n.s.	-0.146	20	n.s.	-0.252	20
CH₄ conc.										n.s.	-0.083	20	n.s.	-0.080	20	n.s.	-0.219	20

Table S2: Spearman's rank correlation coefficients and significance levels for Gibb's free energy of acetoclastic (ACM) and hydrogenotrophic (HTM) methanogenesis, acetate and H₂ concentrations with OM quality parameters. n.s. means that correlations were not significant ($p > 0.05$).

	ACM (t6)			acetate conc. (t6)			HTM			H ₂ conc.		
	<i>p</i>	<i>rho</i>	<i>n</i>	<i>p</i>	<i>rho</i>	<i>n</i>	<i>p</i>	<i>rho</i>	<i>n</i>	<i>p</i>	<i>rho</i>	<i>n</i>
aromatics	<i>n.s.</i>	-0.052	30	< 0.001	-0.585	30	<i>n.s.</i>	0.136	154	< 0.05	-0.187	174
fats, waxes, lipids	<i>n.s.</i>	-0.237	30	< 0.05	-0.440	30	< 0.01	0.255	154	< 0.001	-0.352	174
humic acids	<i>n.s.</i>	0.082	30	< 0.001	-0.634	30	< 0.05	0.183	154	< 0.01	-0.229	174
lignin	<i>n.s.</i>	0.265	30	< 0.01	-0.533	30	<i>n.s.</i>	0.140	154	< 0.05	-0.190	174
phenols	<i>n.s.</i>	0.104	30	< 0.001	-0.668	30	< 0.05	0.196	154	< 0.01	-0.246	174
C	<i>n.s.</i>	-0.062	30	<i>n.s.</i>	0.074	30	< 0.05	0.174	154	< 0.05	-0.149	174
C/N	< 0.05	0.447	30	< 0.01	-0.538	30	<i>n.s.</i>	-0.057	154	<i>n.s.</i>	0.102	174