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Imprint of eutrophication on methane-cycling microbes in freshwater sediment

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Table S1. Data used to construct geochemical profiles of porewater, solid-phase compounds, and dissolved gases in Lake Joux sediments for Figure 2 panels A to M.

Average depth (cm)	PO_4^{3-} (µM)	NO_3^- (µM)	H_2S (µM)	SO_4^{2-} (µM)	N (%)	P (mg kg^{-1})	AVS (µg kg^{-1})	CRS (µg kg^{-1})	DIC (mM)	$\delta^{13}C_{DIC}$ (‰)	$\delta^{13}C_{org}$ (‰)	TOC (%)	TIC (%)	C/N	CH_4 (µM)	$\delta^{13}CH_4$ (‰)	$\varepsilon_{Corg\text{-}CH4}$ (‰)
0.50	0.62	27.07	4.08	4.42	0.75	1229.34	139.62	334.71	2.78	-12.18	-18.31	16.52	12.42	22.00	253.03	-82.06	69.4
4.50	0.89	27.88	8.16	2.33	0.65	1445.48	329.03	510.58	3.27	-10.75	-16.72	15.70	12.94	24.31	345.03	-81.97	71.1
7.50	0.73	17.93	12.24	0.47	0.74	1295.17	400.37	364.92	3.40	-8.02	-14.76	15.59	25.92	20.95	812.62	-84.25	75.9
10.50	0.74	4.96	4.08	0.74	0.35	999.67	418.40	429.68	3.60	-5.25	-10.76	7.30	32.87	21.05	798.00	-83.97	79.9
13.50	0.35	2.28	2.04	0.65	0.39	859.18	338.78	322.41	3.70	-4.05	-11.92	10.50	36.90	26.92	807.31	-83.70	78.3
16.50	0.20	0.00	2.04	0.60	0.32	1027.04	213.39	353.98	4.02	-3.07	-13.57	6.87	39.53	21.68	927.00	-82.79	75.5
19.50	0.00	0.00	4.08	0.35	0.21	2612.27	0.00	157.99	4.23	-0.50	-14.11	8.14	34.28	38.75	1129.39	-83.62	75.9
22.50	0.13	0.00	4.08	0.58	0.23	1899.51	0.00	81.66	3.97	0.10	-18.10	8.22	33.10	35.75	1111.00	-83.59	71.5
25.50	0.00	0.00	6.12	0.56	0.28	1936.08	0.00	42.00	3.71	-1.33	-19.95	9.86	19.90	35.65	1410.16	-83.99	69.9
28.50	0.15	0.00	2.04	0.44	0.32	1431.63	0.00	124.83	4.98	0.44	-18.22	11.01	16.76	34.04	1487.00	-84.33	72.2
31.50	0.15	0.00	8.16	0.45	0.38	1603.06	0.00	82.76	5.91	-10.77	-20.14	15.52	11.76	40.49	1654.57	-83.90	69.6
34.50	0.15	0.00	4.08	3.96	0.97	1315.55	111.59	100.98	2.83	-6.05	-16.68	13.96	19.12	14.45	1723.00	-83.86	73.3
37.50	0.12	0.00	4.08	1.01	0.90	1961.04	141.59	52.72	3.52	-4.95	-24.23	13.30	23.61	14.77	1730.21	-83.26	64.4
40.50	0.12	0.00	14.28	0.52	0.67	2283.19	205.33	102.94	3.68	-3.10	-26.50	13.47	25.43	20.20	1756.00	-83.46	62.1
43.50	0.14	1.00	6.12	0.51	0.63	2193.88	214.76	178.76	4.33	-3.62	-28.22	11.32	25.71	17.94	1760.32	-83.23	60.0

Table S2. Data used to construct geochemical profiles of porewater, solid-phase compounds, and dissolved gases in Lake Joux sediments for Figure 2 panel N.

1		2		3		4		5		6		7	
Depth (cm)	O2 µM	Depth (cm)	O2 µM	Depth (cm)	O2 µM	Depth (cm)	O2 µM	Depth (cm)	O2 µM	Depth (cm)	O2 µM	Depth (cm)	O2 µM
-0.28	223.83	-0.30	211.59	-0.28	310.15	-0.30	256.90	-0.30	285.12	-0.30	248.88	-0.30	294.01
-0.26	240.42	-0.25	226.74	-0.23	310.05	-0.25	287.28	-0.28	278.81	-0.28	247.20	-0.28	297.23
-0.24	243.66	-0.20	242.15	-0.18	308.52	-0.20	273.05	-0.25	252.27	-0.25	244.91	-0.25	297.00
-0.22	242.58	-0.15	245.68	-0.13	297.39	-0.15	221.05	-0.23	235.40	-0.23	243.75	-0.23	295.86
-0.20	240.82	-0.13	235.24	-0.10	281.51	-0.10	222.66	-0.20	234.35	-0.20	244.58	-0.20	294.78
-0.18	239.05	-0.10	221.43	-0.08	259.85	-0.05	201.02	-0.18	240.73	-0.18	247.60	-0.18	293.95
-0.15	238.31	-0.08	202.40	-0.05	233.39	-0.03	188.97	-0.15	245.70	-0.15	252.06	-0.15	293.13
-0.13	236.77	-0.05	179.19	-0.03	201.16	0.00	157.27	-0.13	252.98	-0.13	256.43	-0.13	292.90
-0.10	232.23	-0.03	153.76	0.00	163.34	0.03	136.82	-0.10	259.70	-0.10	256.84	-0.10	289.65
-0.08	223.94	0.00	129.38	0.03	121.32	0.05	112.96	-0.08	259.99	-0.08	251.03	-0.08	282.55
-0.05	209.83	0.03	114.24	0.05	79.29	0.08	100.25	-0.05	250.86	-0.05	235.30	-0.05	269.44
-0.03	189.74	0.05	100.63	0.08	52.49	0.10	88.69	-0.03	231.46	-0.03	211.40	-0.03	249.35
0.00	161.92	0.07	83.63	0.10	26.09	0.13	78.01	0.00	202.24	0.00	181.65	0.00	228.56
0.03	129.79	0.09	73.76	0.13	3.99	0.15	60.45	0.03	169.17	0.03	158.79	0.03	210.74
0.05	95.46	0.11	48.12	0.15	-0.03	0.18	49.24	0.05	134.00	0.05	135.37	0.05	187.24
0.08	62.33	0.13	31.51	0.17	0.12	0.20	45.01	0.08	114.83	0.08	115.17	0.08	170.12
0.10	37.66	0.15	24.17	0.19	-0.05	0.23	42.31	0.10	94.06	0.10	98.44	0.10	152.97
0.12	22.58	0.17	17.34	0.21	0.50	0.25	38.14	0.13	72.98	0.13	81.39	0.13	131.26
0.14	8.97	0.19	10.86	0.23	0.28	0.27	29.28	0.15	48.95	0.15	60.69	0.15	116.88
0.16	0.47	0.21	6.09	0.25	-0.23	0.29	24.22	0.18	26.27	0.18	42.65	0.18	105.11
0.18	0.00	0.23	1.89	0.27	-0.01	0.31	21.36	0.20	11.10	0.20	26.99	0.20	81.23
0.20	0.00	0.25	0.13	0.29	-0.44	0.33	17.23	0.23	0.78	0.23	13.85	0.23	65.09

0.22	0.00	0.27	0.00	0.31	-0.20	0.35	8.09	0.25	0.00	0.25	3.57	0.25	49.59
0.24	0.00	0.29	0.00	0.34	0.25	0.37	3.19	0.28	0.00	0.28	0.00	0.28	35.67
0.26	0.00	0.31	0.00	0.36	0.36	0.39	0.74	0.30	0.00	0.30	0.00	0.30	20.25
0.28	0.00	0.33	0.00	0.39	-0.23	0.41	0.24	0.33	0.00	0.33	0.00	0.33	10.45
0.30	0.00	0.35	0.00	0.03		0.43	0.40	0.35	0.00	0.35	0.00	0.35	4.66
0.35	0.00	0.40	0.00	0.03		0.45	0.15	0.38	0.00	0.38	0.00	0.38	0.00
		0.45	0.00	0.03		0.47	0.00	0.40	0.00	0.40	0.00	0.40	0.00
		0.50	0.00	0.03		0.50	0.06	0.43	0.00	0.43	0.00	0.43	0.00
								0.45	0.00	0.45	0.00	0.45	0.00
								0.48	0.00	0.48	0.00	0.48	0.00
								0.50	0.00	0.50	0.00	0.50	0.00
										0.53	0.00	0.53	0.00
										0.55	0.00	0.55	0.00
												0.58	0.00
												0.60	0.00

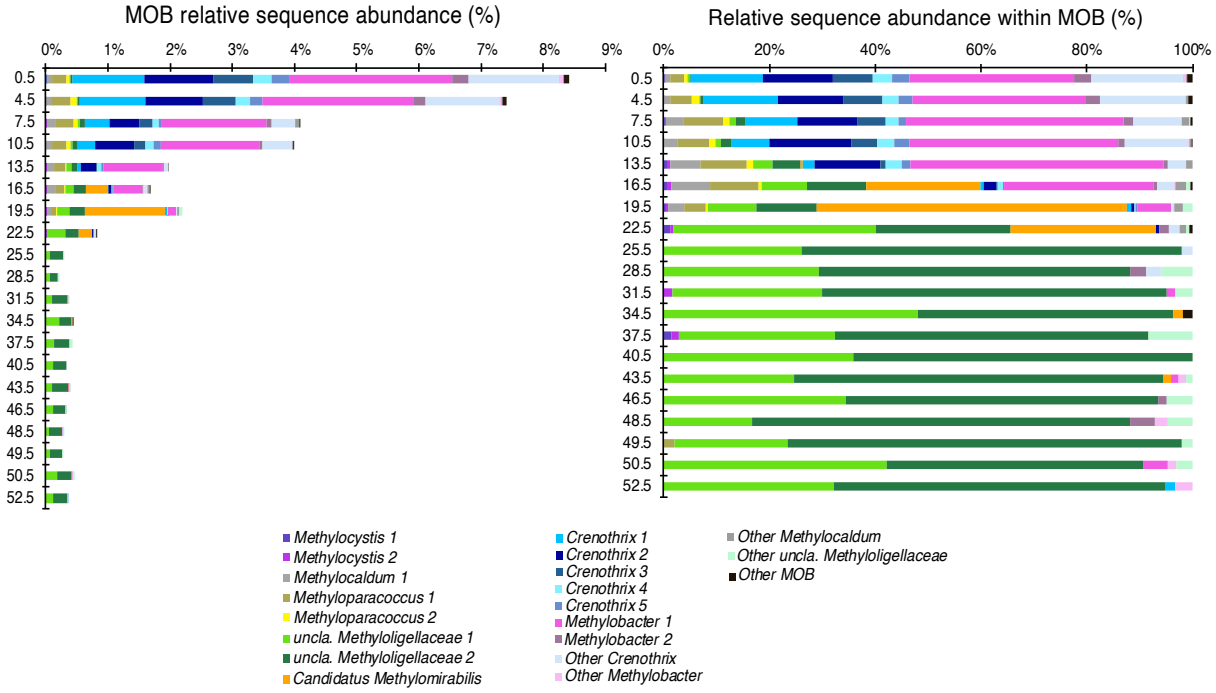

Figure S1. Depth profiles of methane-oxidizing bacteria (MOB). (A) MOB relative sequence abundance in the total microbial community. (B) MOB composition expressed as relative sequence abundance within the MOB fraction (16S rRNA gene amplicons). Shades of the same color denote the same genera; distinct colors indicate different genera.

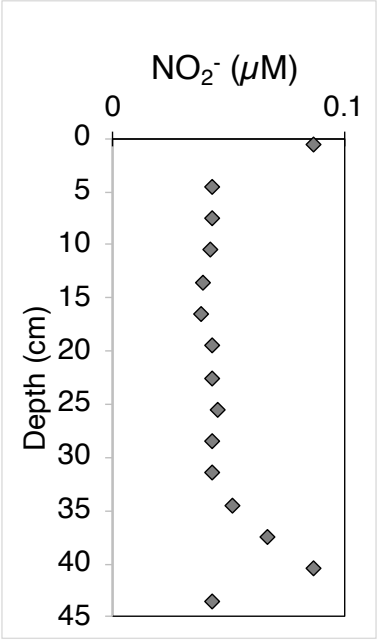

Figure S2. Porewater nitrite (NO_2^-) concentrations versus depth in Lake Joux sediments.

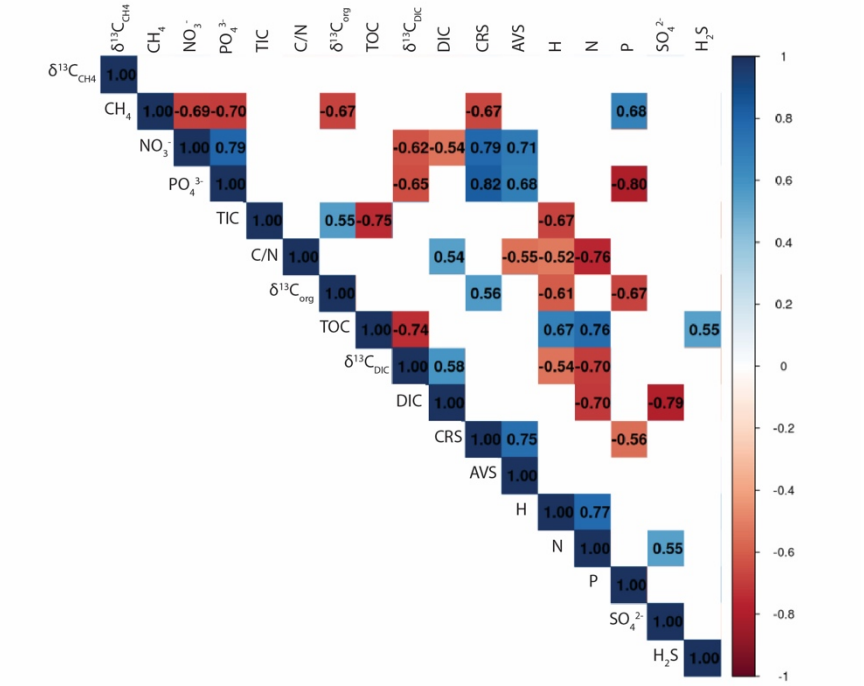

Figure S3 - Co-correlation matrix of Spearman pairwise correlation coefficients calculated on a z-scored matrix of environmental variables.

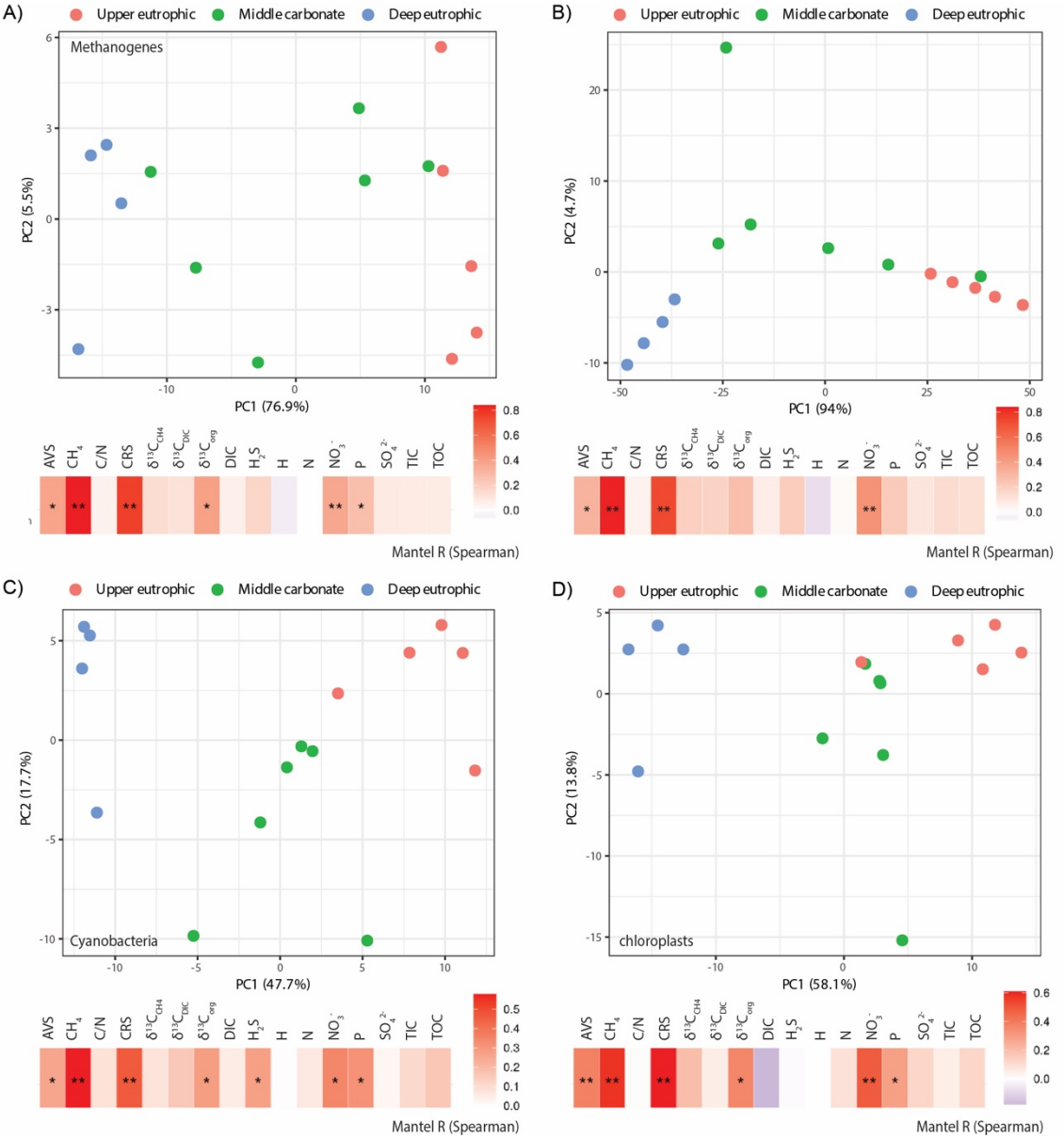

Figure S4 - Principal component ordination of centered log ratio (CLR) transformed 16S rRNA gene amplicon data for specific microbial subpopulations, based on an Aitchson distances for which oversaturated distances were corrected and smoothed using LMdist and mantel tests results (Spearman's rank correlation) of subcommunity dissimilarity (corrected and smoothed Aitchinson distance) and environmental parameters (z-scored). P-values were adjusted for multiple testing using the false discovery rate (FDR) method. ** p <= 0.01; * p <= 0.05. (A) Methanogens. (B) MOB. (C) Cyanobacteria. (D) chloroplasts.