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Supplement of

Effects of low oxygen concentrations on aerobic methane oxidation in seasonally hypoxic coastal waters

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1 Supplementary Tables

1.1 Supplementary Table S1

Table S1. Oxygen concentrations and consumption rates during the oxygen dependency experiment and corresponding methane oxidation rates determined with $^3\text{H-CH}_4$ in Feb. 2014. Standard deviation (n=3) of initial ($[\text{O}_2]_{\text{initial}}$) and final ($[\text{O}_2]_{\text{final}}$) oxygen concentrations, and r_{MOx} are indicated. $t_{\text{incubation}}$ corresponds to incubation time and O_2 cons. to the oxygen consumption per hour.

$[\text{O}_2]_{\text{initial}}$ [$\mu\text{mol L}^{-1}$]	$[\text{O}_2]_{\text{final}}$ [$\mu\text{mol L}^{-1}$]	$t_{\text{incubation}}$ [h]	O_2 cons. [$\mu\text{mol L}^{-1} \text{h}^{-1}$]	r_{MOx} [$\text{nmol L}^{-1} \text{CH}_4 \text{d}^{-1}$]
0.02 ± 0.04	0.01 ± 0.01	8.15	0.001	1.8 ± 0.1
0.10 ± 0.01	0.04 ± 0.02	8.25	0.007	1.5 ± 0.2
0.19 ± 0.02	0.08 ± 0.01	11.70	0.010	1.4 ± 0.2
0.40 ± 0.01	0.08 ± 0.02	12.00	0.026	1.3 ± 0.1
1.8 ± 0.0	0.78 ± 0.18	12.75	0.082	1.4 ± 0.1
13.0 ± 1.8	7.8 ± 1.1	13.00	0.402	1.4 ± 0.3
39.7 ± 1.1	30.9 ± 2.8	19.85	0.442	1.5 ± 0.1
125 ± 1	107 ± 0	19.90	0.864	1.5 ± 0.1
226 ± 1	209 ± 6	19.95	0.815	1.0 ± 0.1

1.2 Supplementary Table S2

Table S2. Oxygen concentrations and consumption rates during the oxygen dependency experiment and corresponding methane oxidation rates determined with $^3\text{H-CH}_4$ in June 2014. Standard deviation (n=3) of initial ($[\text{O}_2]_{\text{initial}}$) and final ($[\text{O}_2]_{\text{final}}$) oxygen concentrations, and r_{MOx} are indicated. $t_{\text{incubation}}$ corresponds to incubation time and O_2 cons. to the oxygen consumption per hour.

$[\text{O}_2]_{\text{initial}}$ [$\mu\text{mol L}^{-1}$]	$[\text{O}_2]_{\text{final}}$ [$\mu\text{mol L}^{-1}$]	$t_{\text{incubation}}$ [h]	O_2 cons. [$\mu\text{mol L}^{-1} \text{h}^{-1}$]	r_{MOx} [$\text{nmol L}^{-1} \text{CH}_4 \text{d}^{-1}$]
0.35 ± 0.16	0.51 ± 1.11	10.92	-0.015	2.0 ± 0.8
0.94 ± 0.05	0.74 ± 0.90	10.92	0.019	1.1 ± 0.6
1.9 ± 0.0	1.3 ± 1.1	11.50	0.052	0.3 ± 0.1
5.2 ± 0.2	1.4 ± 2.0	11.75	0.322	0.2 ± 0.0
14.5 ± 0.7	8.8 ± 0.8	11.75	0.489	0.4 ± 0.0
55.6 ± 3.6	53.0 ± 6.1	16.75	0.151	0.3 ± 0.3
75.9 ± 5.7	82.2 ± 2.4	16.75	-0.377	0.6 ± 0.3
228 ± 2.3	225 ± 2.4	16.75	0.215	0.3 ± 0.3

2 Supplementary Figures

2.1 Supplementary Figure S1

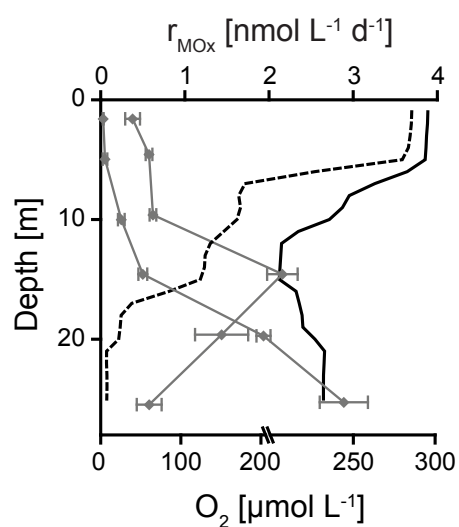


Figure S1. Profiles of unusual oxygen and methane oxidation rate profiles in Nov. 2013. Oxygen profiles (black lines) and methane oxidation rates (grey lines) from Oct. 2012 (dashed lines) and Nov. 2013 (solid lines). Error bars show the standard deviation (n=4). The profiles from Oct. 2012 show a 'usual' trend for fall (i.e., depletion of oxygen with depth and increase of methane oxidation rates), whereas in Nov. 2013 profiles show some deviations (i.e., higher oxygen in bottom waters than at 10 mbsl and lower rates in bottom waters).

2.2 Supplementary Figure S2

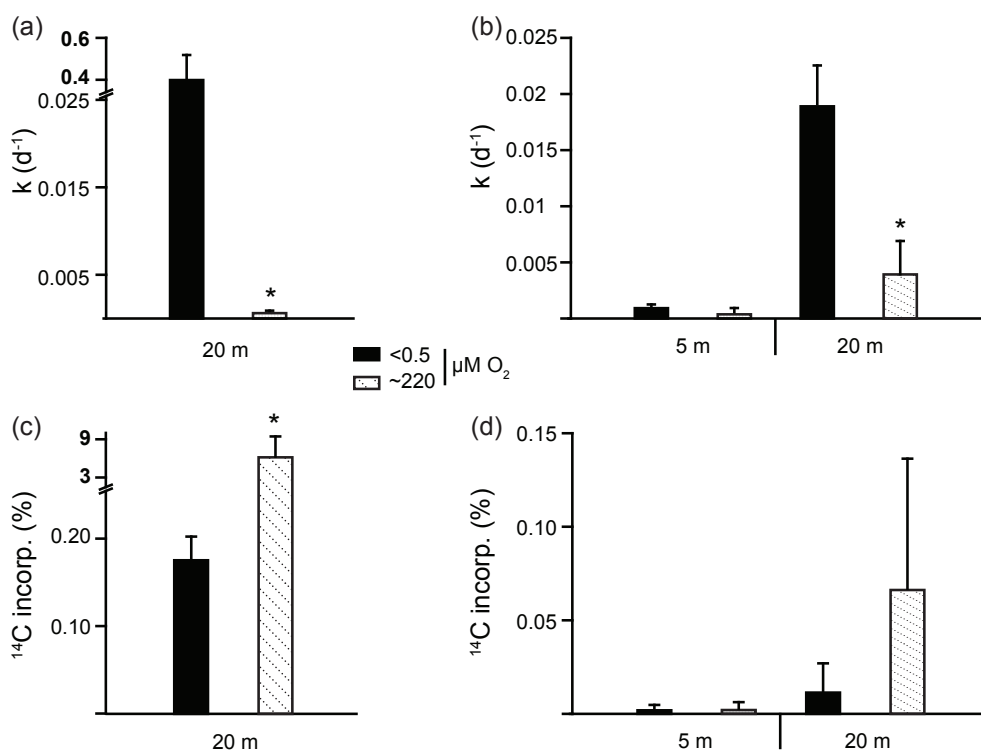


Figure S2. Methane-carbon assimilation in relation to oxygen concentration. Methane-carbon assimilation was determined from incubations amended with $^{14}\text{C}\text{-CH}_4$ at saturated ($\sim 220 \mu\text{mol L}^{-1}$, shaded bars) or low oxygen concentrations ($<0.5 \mu\text{mol L}^{-1}$, black bars) of water recovered in Nov. 2013 at 20 mbsl (a, c) and in Feb. 2014 at 5 and 20 mbsl (b, d). Incubations were performed in triplicates and standard deviations are indicated. (a, b) First-order rate constant k . (c, d) Fraction of oxidized methane incorporated into biomass. Asterisks indicate a p-value <0.05 of a two-tailed, two-sample t-test assuming equal variance between the samples at low and high oxygen concentrations.

2.3 Supplementary Figure S3

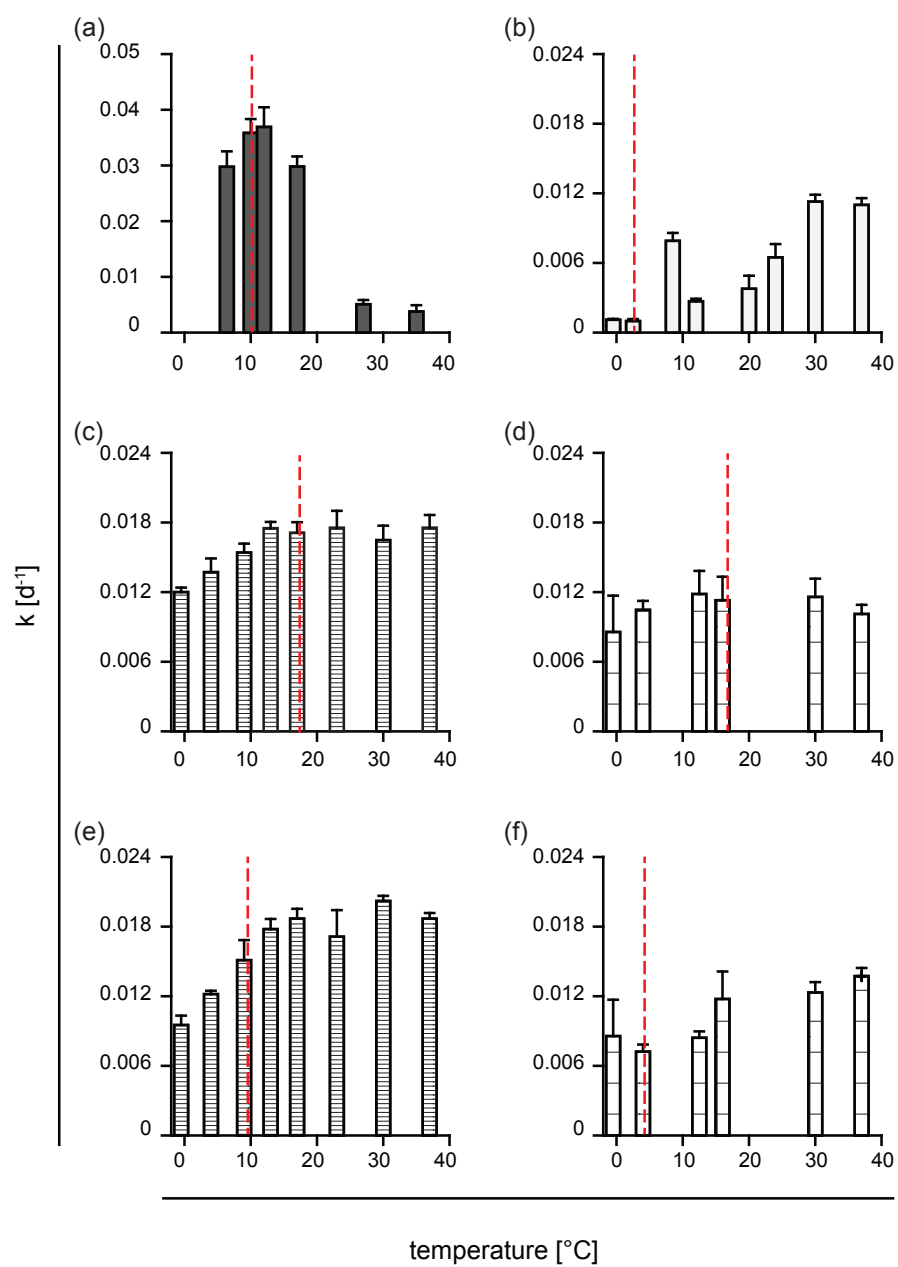


Figure S3. MOx first order rate constants (k) at different temperatures. First order rate constants of MOx were determined with $^3\text{H}\text{-CH}_4$ amendments in triplicated incubations of water from 5 mbsl (a-d) and 20 mbsl (e, f), recovered in Nov. 2013 (a), Feb. 2014 (b), June 2014 (c, e), and Sept. 2014 (d, f). Red, dashed lines indicate the in situ temperatures for each date.