Supplements

Regulation of nitrous oxide production in low oxygen waters off the coast of Peru

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Table S1: Average alpha diversities of total and active archaeal *amoA* and *nirS* communities.

	nirS	***amoA***
DNA	3.8 ± 0.4	3.6 ± 0.1
cDNA	3.4 ± 0.5	3.2 ± 0.3

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Table S2: Overview of abundant archetypes (> 1%) that are significantly enriched in respective O_2 levels (Lefse analysis). O_2 levels were split in 3 categories: anoxic (<1 µmol L^{-1} O_2, Seabird O_2 and Winkler titration detection limits), hypoxic (1 – 10 µmol L^{-1} O_2), oxic (> 10 µmol L^{-1} O_2).

amoA	**archetype**	**anoxic**	**hypoxic**	**oxic**	*nirS*	**archetype**	**anoxic**	**hypoxic**	**oxic**
DNA	AOA3			x	DNA	nir4			x
	AOA7	x				nir14			x
	AOA78			x		nir23	x		
	AOA83			x		nir46	x		
						nir166	x		
cDNA	AOA3			x	cDNA	nir4			x
	AOA7		x			nir14			x
	AOA83			x		nir23	x		
						nir141			x
						nir166	x		

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Table S3: All samples with rates, standard errors, fraction label (f_N), yields, copy numbers mL^{-1} of *nirS* and *amoA* genes and transcripts.

sample ID	station	depth (m)	oxygen (µM)	f NH4+	f NO2-	f NO3-	N2O pro (nM /d) NH4-	SE	%hybrid from total N2O	NH4 oxi (nM /d)	SE	N2O Yield (%) NH4+	SE yield	N2O pro (nM /d) NO2-	SE	%hybrid from total N2O	N2O pro (nM /d) NO3-	SE	NO3- reduction (nM /d)	SE	N2O Yield (%) NO3-	STD yield	nirS gene copy numbers*mL-1	STD	nirS transcript copy numbers*mL-1	STD	amoA gene copy numbers*mL-1	STD	amoA transcript copy numbers *mL-1	STD
S1	882	298	0.2	0.98	0.45	0.058	0.0	0.002	-	0.89	0.22	nd	0.00	0.04	0.00	0.000	2.67	0.39	7.20	1.7	42.53	0.28	412319.0	1879.7	2707.3	135.7	2548.1	17.3	30.6	12.2
S2	882	352.6	bd	0.97	0.39	0.055	0.0	0.001	-	0.00	0.24	nd	0.00	0.09	0.03	18.98	2.20	0.35	19.42	8.3	18.49	0.45	530804.0	36269.9	4880.8	362.9	4082.7	259.3	143.4	10.4
S3	882	258.7	1.5	0.99	0.22	0.059	0.0253	0.000	77.8	3.62	1.21	1.40	0.49	0.11	0.02	21.9	1.36	0.61	14.8	1.5	15.45	0.46	116275.5	3138.8	424.9	17.4	974.8	97.2	20.6	0.8
S4	882	218.9	6.06	0.97	0.77	0.056	0.0310	0.000	78.1	8.00	1.69	0.78	0.18	0.06	0.01	63.6	1.05	0.47	7.53	2.1	21.76	0.53	81055.2	10685.0	829.8	45.9	2018.8	187.6	240.9	41.4
S5	882	73.9	8.4	0.98	0.95	0.059	0.1411	0.003	79.4	35.71	9.07	0.79	0.43	0.02	0.00	79.2	0.00	0.78	5.90	2.4	0.00	0.00	19971.7	1455.5	54.8	22.1	14462.8	656.3	628.4	10.0
S6	883	304.1	bd	0.99	0.21	0.064	0.0	0.001	-	0.33	0.99	nd	0.00	0.29	0.29	37.16	1.57	0.32	34.67	5.59	8.30	0.26	618285.8	19727.5	2716.5	247.3	4000.4	99.9	44.0	10.8
S7	883	268.1	0.2	0.99	0.18	0.065	0.0	0.001	-	0.98	0.30	nd	0.00	0.71	0.38	0.00	5.65	2.82	46.65	6.97	19.49	0.52	293503.7	45312.4	1749.2	198.9	1920.1	21.8	47.3	0.2
S8	883	249.4	2.25	0.99	0.21	0.062	0.0017	0.000	83.3	0.95	0.40	0.35	0.35	0.20	0.07	0.00	2.62	0.90	17.44	4.61	23.11	0.43	372479.5	1698.1	4006.6	690.7	2601.8	124.0	104.8	3.1
S9	883	189	1.6	0.99	0.99	0.058	0.0647	0.001	83.8	10.94	1.27	1.18	0.31	0.14	0.02	88.04	1.05	0.77	15.08	1.61	12.20	0.75	16892.7	539.0	48.9	0.7	18113.5	452.2	626.2	29.8
S10	883	28	30.1	0.99	0.91	0.065	0.1596	0.003	86.6	34.07	0.11	0.94	0.42	0.07	0.03	52.79	0.00	2.53	13.49	4.44	0.00	0.00	6331.1	86.6	42.1	5.0	24513.8	389.5	521.7	8.3
S11	894	118.9	bd	0.98	0.96	0.060	0.0879	0.001	78.9	2.71	1.01	0.27	0.14	0.09	0.01	76.3	5.86	0.48	6.4	2.1	64.86	0.34	185531.9	845.8	2421.5	154.4	6800.4	15.4	284.8	7.4
S12	904	179.4	bd	nd	0.26	0.070	nd	nd	nd	nd	nd	nd	nd	0.19	0.06	0.00	4.39	0.77	8.47	4.05	50.90	0.51	426523.5	1944.5	4347.9	632.0	6000.2	108.9	233.5	8.5
S13	904	124.0	0.25	nd	0.82	0.060	nd	nd	nd	nd	nd	nd	nd	0.16	0.00	90.52	7.20	1.64	9.06	2.62	61.40	0.37	153881.6	2806.0	562.2	74.1	6435.6	14.6	198.2	10.3
S14	906	147.1	bd	nd	0.33	0.070	nd	nd	nd	nd	nd	nd	nd	0.32	0.07	13.67	3.63	0.28	38.0	11.7	16.05	0.32	318507.1	1452.0	2104.1	67.1	6031.7	150.6	88.7	14.2
S15	907	130	0.44	0.97	0.25	0.110	0.0180	0.000	82.0	11.38	1.80	0.32	0.13	0.30	0.10	39.3	1.23	0.23	17.51	4.66	12.36	0.32	729635.6	3326.3	4276.9	0.0	4212.9	143.4	140.6	8.6
S16	907	9.2	209.3	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	6250.4	795.7	14.8	4.4	994.1	6.8	45.9	5.9
S17	912	89.8	1.44	0.97	0.38	0.090	0.1227	0.002	80.2	11.86	1.90	2.07	0.34	3.06	1.17	83.55	118.00	27.80	32.50	12.38	87.8	39.3	789262.1	21586.2	9472.8	647.3	3077.8	7.0	246.6	5.0
S18	912	4.7	204.5	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	15921.1	508.0	44.3	10.8	2589.8	152.7	110.7	2.8
S19	892	143.7	bd	0.76	0.11	0.090	0.0337	0.000	71.0	1.79	0.356	0.16	0.05	0.72	0.19	0.0	1.63	0.30	12.69	1.12	20.47	0.20	1010946.4	4608.8	291021.5	31778.2	2936.5	119.9	49.8	5.8
S20	906	92.2	0.46	nd	0.11	0.080	nd	nd	nd	nd	nd	nd	nd	2.37	0.54	0.00	4.88	0.41	53.8	4.2	15.34	0.11	351334.8	9609.0	1556.3	835.7	6529.0	59.3	204.0	18.5
S21	917	139.2	bd	nd	0.1	0.100	nd	nd	nd	nd	nd	nd	nd	0.76	0.25	0.0	0.36	0.13	27.5	4.8	2.63	0.20	969128.0	8836.2	759.6	80.2	2725.7	0.0	32.7	0.7
Average							0.049		80.1	8.8		0.8		0.5		35.0	8.7		20.4		26.0									
STD							0.057		4.2	11.9		0.6		0.8		35.4	2.2		14.4		24.2									

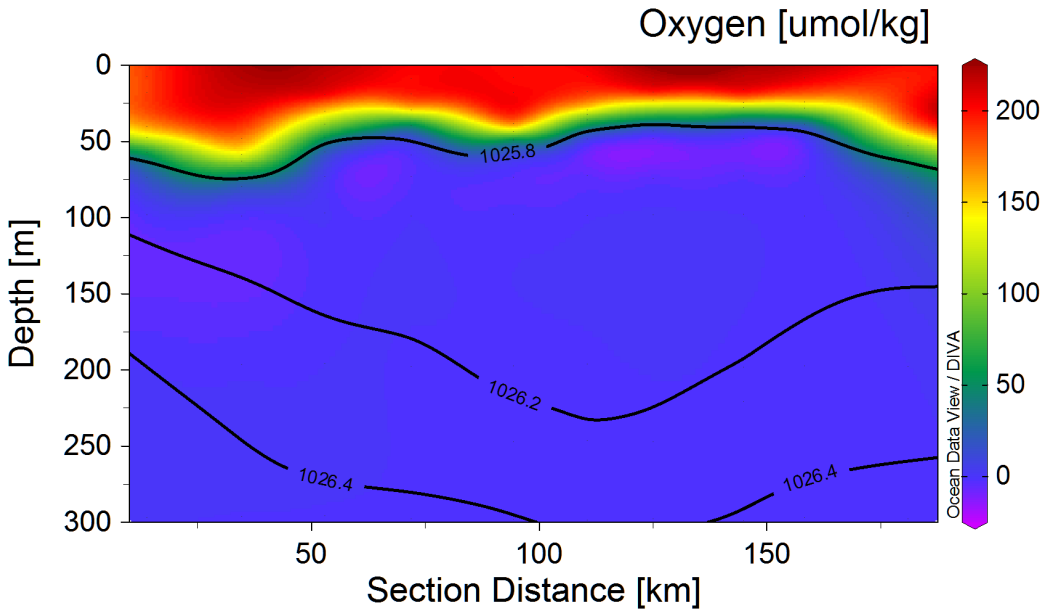
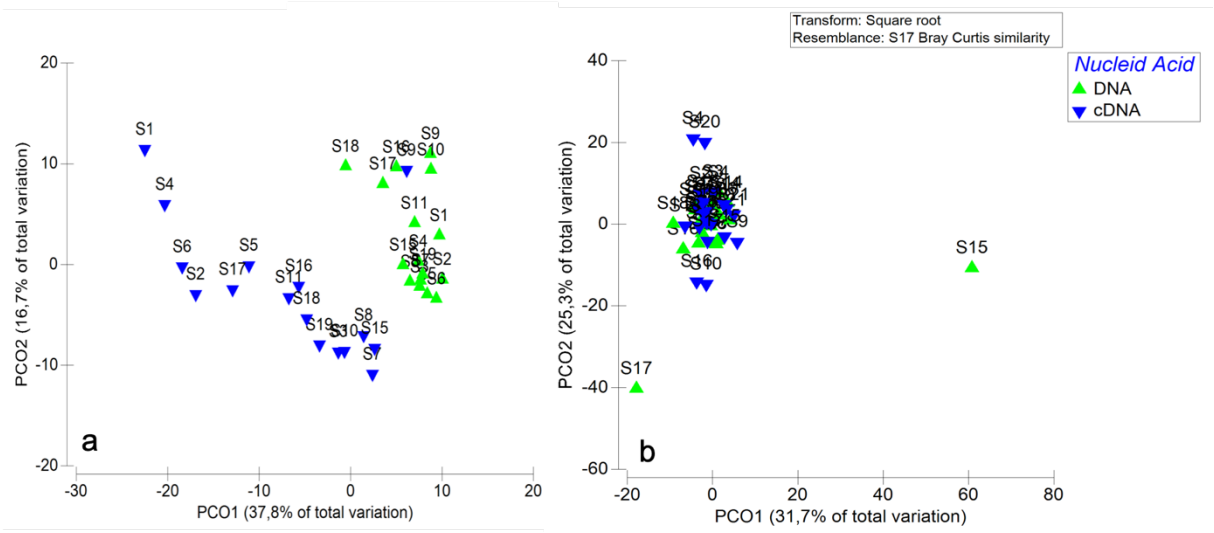


Figure S1: Oxygen and density contours plot from CTD data.



25 **Figure S2**: Principle component analysis of amoA DNA and cDNA (a) and *nirS* DNA and cDNA (b).

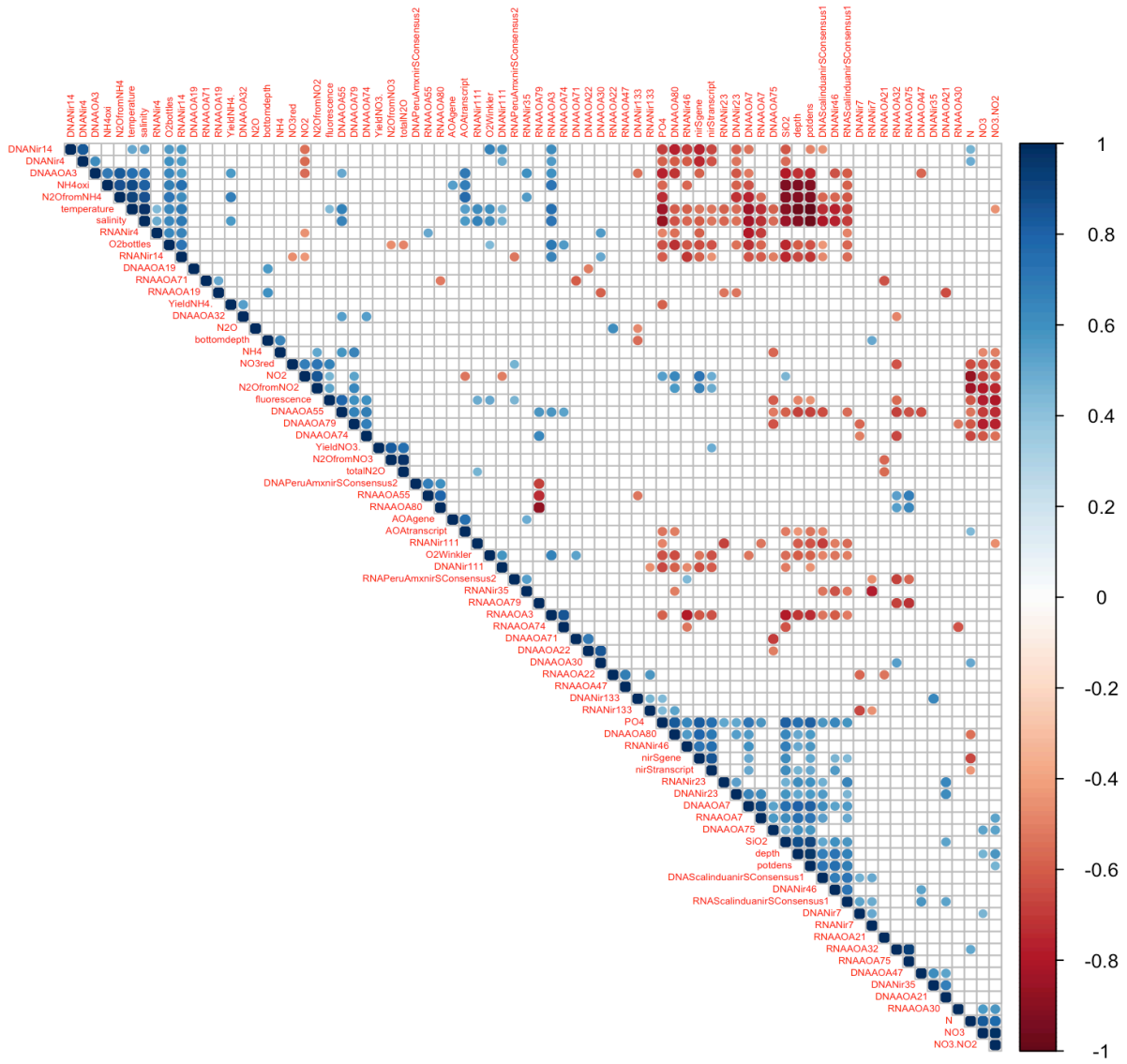


Figure S3: Heat map of significant positive (blue) or negative (red) correlations ($p<0.05$) based on a Spearman Rank correlation analysis.

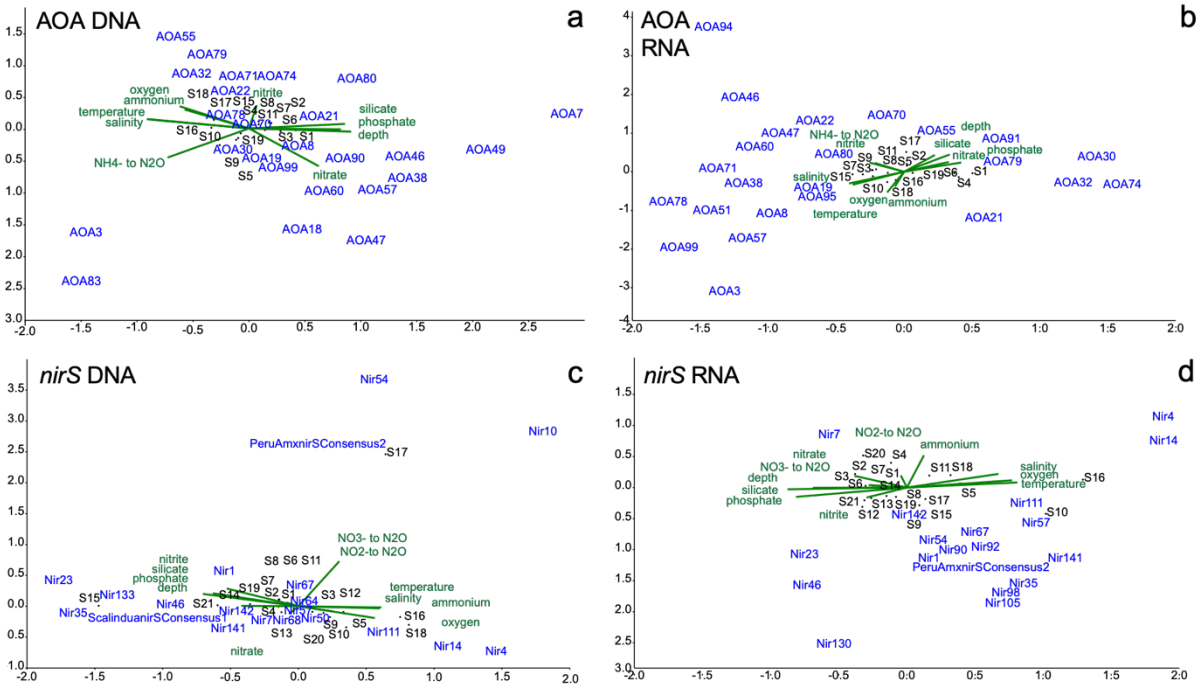


Figure S4: Triplot of Canonical Correspondence Analysis showing the archetype composition as a response to the environmental parameters. Upper panel shows *amoA* (a,b) and lower panel *nirS* archetypes (c,d). On the right is the DNA (a,c) and on the left is the cDNA (b,d).

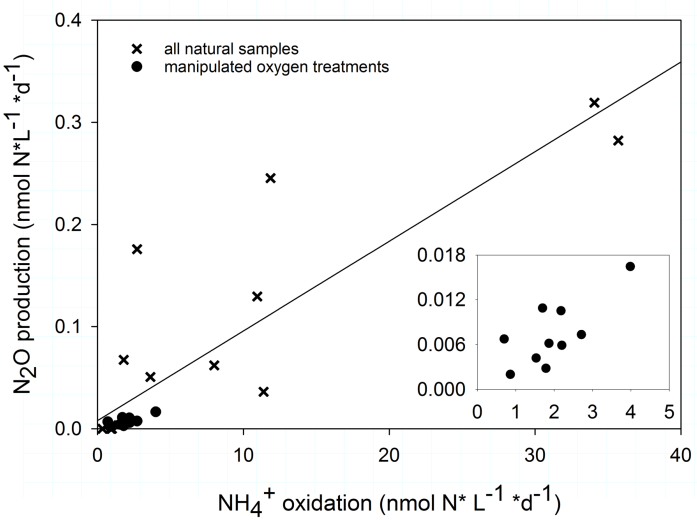


Figure S5: Scatter plot of AO versus N_2O production from NH_4^+, zoom up shows manipulated treatments with small AO rates. Linear fit with $y = 0.0088\ x + 0.0080$ $R^2 = 0.75$, $p<0.0001$.

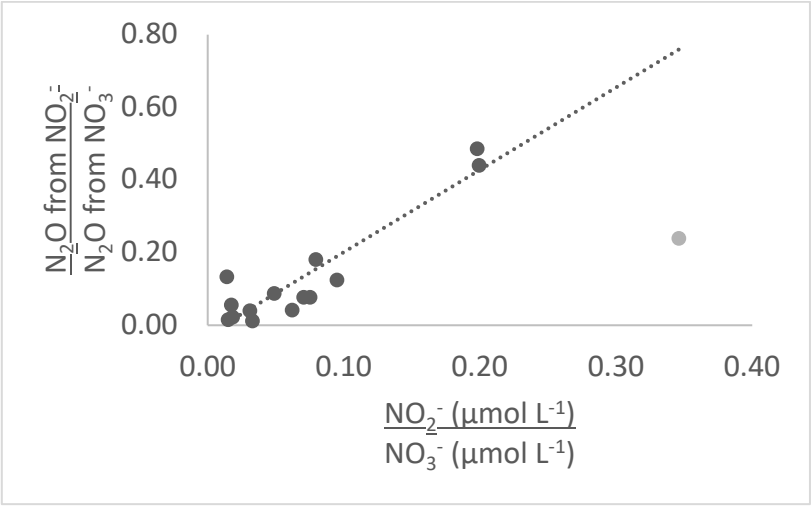


Figure S6: Scatter plot of the ratio of N_2O production rates from NO_2^- and that from NO_3^- plotted against ratio of NO_2^- and NO_3^- concentrations. Linear fit with $y = 2.267 x - 0.0254$ $R^2 = 0.86$, $p<0.0001$