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*Supplement of*

## **Aphotic N<sub>2</sub> fixation along an oligotrophic to ultraoligotrophic transect in the western tropical South Pacific Ocean**

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# Supplementary material

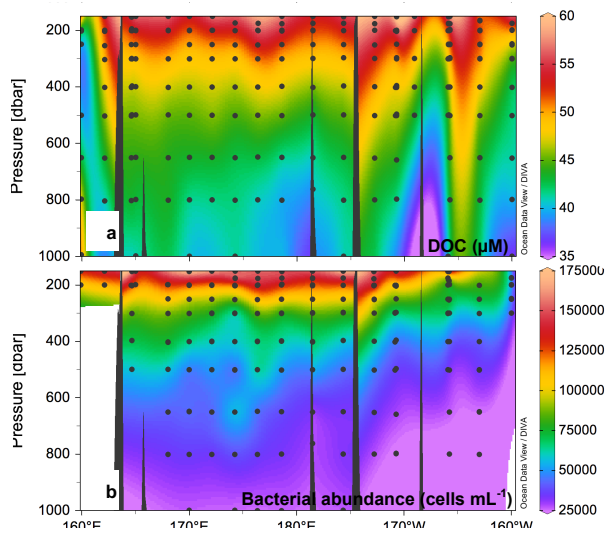


Figure S1: Longitudinal sections of (a) dissolved organic carbon concentrations (DOC;  $\mu\text{M}$ ), and (b) bacterial abundance ( $\text{cells mL}^{-1}$ ).

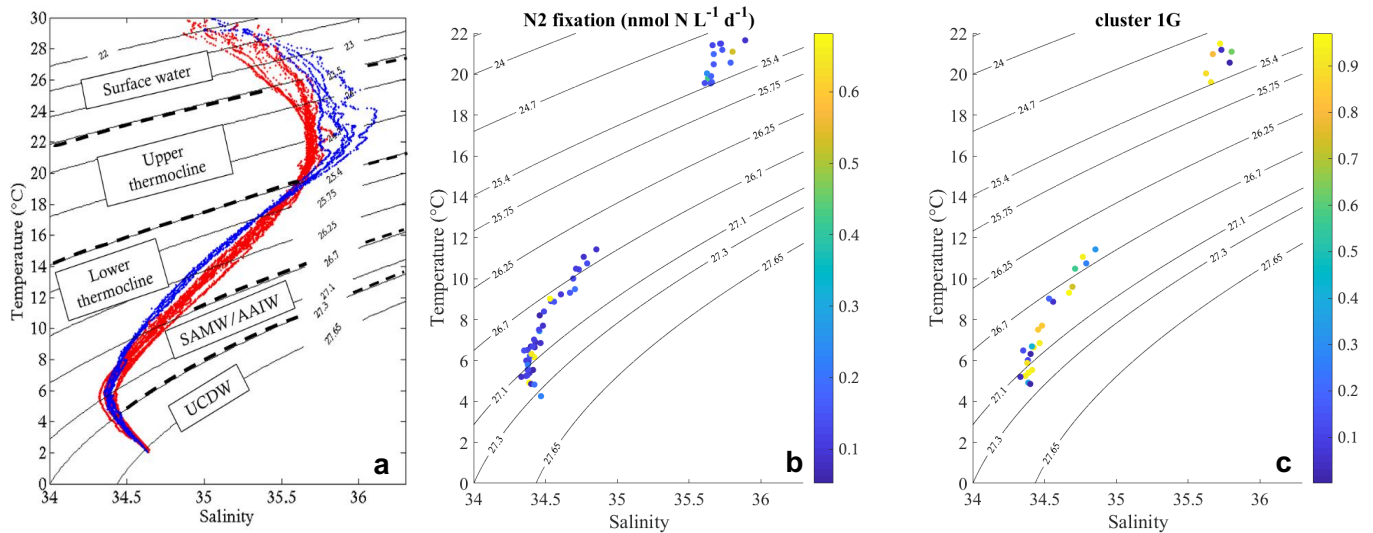


Figure S2: Temperature-salinity (T/S) diagrams from all stations sampled during the OUTPACE cruise, showing the main water masses sampled as in Fumenia et al., 2018 (Sub-Antarctic Mode Water -SAMW-, Antarctic Intermediate Water -AAIW-, Upper Circumpolar Deep Water -UCDW-), N<sub>2</sub> fixation rates (b) and abundance of the *nifH* subcluster 1G (c) superimposed over the T/S diagram. According to the T/S diagram, N<sub>2</sub> fixation and *nifH* gene samples were taken in the lower part of the upper thermocline ( $\sigma_t=24.7-25.4$ ), lower part of the lower thermocline ( $\sigma_t=26.5-26.7$ ), and SAMW/AAIW ( $\sigma_t=26.7-27.3$ ). No measurements are available in the two water masses of the central thermocline, and thus the vertical coverage in the mesopelagic water column is not enough to discern if other water masses affected N<sub>2</sub> fixation and/or *nifH* diversity.

**Supplementary tables**

**Table S1:** Bonferroni-corrected Spearman correlations between environmental variables (temperature, salinity, oxygen), dissolved inorganic nitrogen (NO<sub>x</sub>) concentrations, phosphate (PO<sub>4</sub><sup>3-</sup>) concentrations, N<sub>2</sub> fixation rates, the first and second principal coordinates of dissolved organic matter (DOM, explaining 87 and 5 %, respectively), and the principal coordinates of *nifH* operational taxonomic units (OTUs; explaining 22.3, 14.7 and 10.9%, respectively). Correlations significant at the 0.05 level are signaled with an asterisk (\*), those significant at the 0.01 level with two asterisks (\*\*).

Parameter	Spearman correlation	Salinity	Temperature	Oxygen	DOC	NO <sub>x</sub>	PO <sub>4</sub> <sup>3-</sup>	N <sub>2</sub> fixation	DOM PCo1	DOM PCo2	<i>nifH</i> OTU PCo1	<i>nifH</i> OTU PCo2	<i>nifH</i> OTU PCo3
Salinity	Coefficient	1	0.905**	0.711**	0.725**	-0.683**	-0.699**	0.284*	0.173	-0.203	-0.371	0.195	0.257
	Significance	.	0	0	0	0	0	0.029	0.454	0.434	0.468	0.362	0.623
Temperature	Coefficient		1	0.850**	0.701**	-0.830**	-0.842**	.263*	0.11	-0.279	-0.543	0.175	0.143
	Significance		.	0	0	0	0	0.045	0.634	0.277	0.266	0.414	0.787
Oxygen	Coefficient			1	.622**	-0.773**	-0.853**	0.185	0.188	-0.091	0	0.231	-0.1
	Significance			.	0	0	0	0.173	0.414	0.729	1	0.313	0.873
DOC	Coefficient				1	-0.525**	-0.564**	.269*	-0.078	-0.387	-0.6	0.101	0.371
	Significance				.	0	0	0.042	0.737	0.125	0.208	0.647	0.468
NO <sub>x</sub>	Coefficient					1	.960**	-0.054	-0.145	0.093	0.657	-0.283	0.657
	Significance					.	0	0.7	0.541	0.762	0.156	0.18	0.156
PO <sub>4</sub> <sup>3-</sup>	Coefficient						1	-0.103	-0.151	0.104	0.657	-0.287	0.657
	Significance						.	0.453	0.524	0.734	0.156	0.175	0.156
N <sub>2</sub> fixation	Coefficient							1	-0.356	0.083	-0.371	-0.199	0.371
	Significance							.	0.113	0.751	0.468	0.364	0.468
DOM PCo1	Coefficient								1	0.385	.	-1.000**	.
	Significance								.	0.217	.	.	.
DOM PCo2	Coefficient									1	.	.	.
	Significance									.	.	.	.
<i>nifH</i> OTU PCo1	Coefficient										1	.	0.6
	Significance										.	.	0.4
<i>nifH</i> OTU PCo2	Coefficient											1	.
	Significance											.	.
<i>nifH</i> OTU PCo3	Coefficient												1
	Significance												.