Supplement of Biogeosciences, 18, 4305–4320, 2021
https://doi.org/10.5194/bg-18-4305-2021-supplement


Biogeosciences Open Access EGU

*Supplement of*

# Nitrogen loss processes in response to upwelling in a Peruvian coastal setting dominated by denitrification – a mesocosm approach

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**Table S1.** Measured denitrification rates ($\mathrm{nmol\,N_2\,L^{-1}h^{-1}}$) in the low N/P and very low N/P deep water addition incubations and the surrounding Pacific, at various days. The average uncertainty, calculated from the standard error of the regression slope, was 20% of measured rates. Numbers in brackets refer to rates that exceeded the theoretical maximum, based on substrate availability.

| **Mesocosm** | **Measured denitrification rates** ($\mathrm{nmol\,N_2\,L^{-1}h^{-1}}$) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **low N/P** | T8 | T12 | T16 | T22 | T26 | T30 | T34 | T38 | T42 | T46 |
| **M2** | 14.99 | 7.77 | 1.96 | (28.92) | (18.51) | (37.20) | (15.76) | (15.4) | (19.93) | (8.05) |
| **M3** | 4.70 | 10.74 | 10.23 | 8.51 | (27.46) | (28.93) | (22.08) | 21.24 | (20.56) | (7.87) |
| **M6** | 3.86 | 20.46 | 3.32 | 7.08 | (16.74) | (16.93) | (14.37) | (16.24) | (12.08) | 3.02 |
| **M7** | 5.94 | 3.92 | 4.62 | (14.15) | (13.81) | (20.91) | (22.64) | (13.08) | (10.90) | (10.18) |
| **very low N/P** | | | | | | | | | | |
| **M1** | 6.68 | 18.65 | 13.8 | (32.34) | (30.62) | (24.79) | (29.32) | 0.89 | 3.9 | 7.39 |
| **M4** | 0.74 | 43.33 | 11.46 | 7.51 | 23.78 | (28.79) | (4.64) | 2.47 | 1.35 | 0.32 |
| **M5** | 5.33 | 82.23 | 4.05 | (25.34) | (17.30) | (5.55) | (13.41) | (12.68) | (16.21) | 3.36 |
| **M8** | 10.81 | 7.85 | 4.67 | (13.23) | (6.67) | (22.83) | (17.24) | (7.21) | (9.78) | 1.00 |
| **PACIFIC** | 9.19 | (46.52) | 7.45 | 18.12 | 0.10 | 2.72 | 0.22 | 0.00 | 0.26 | 50.52 |

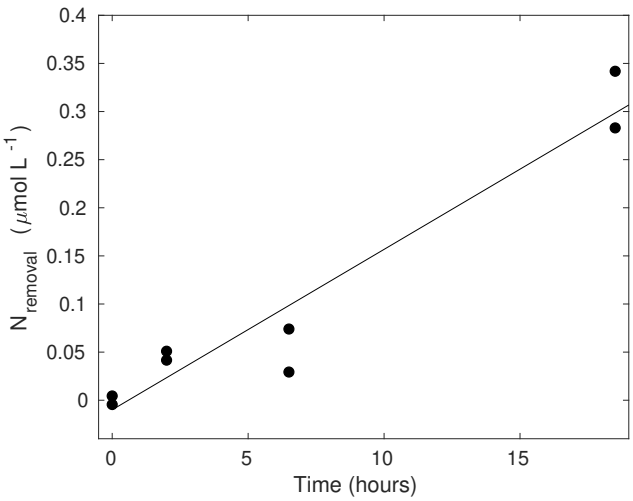


**Figure S1.** Example of nitrogen removal during label incubations (Pacific on Day 8) as calculated according to Eq. 1. Denitrification or anammox rates were calculated from the slope of a linear fit to the data. It is acknowledged that in some samples a lag-phase was encountered.

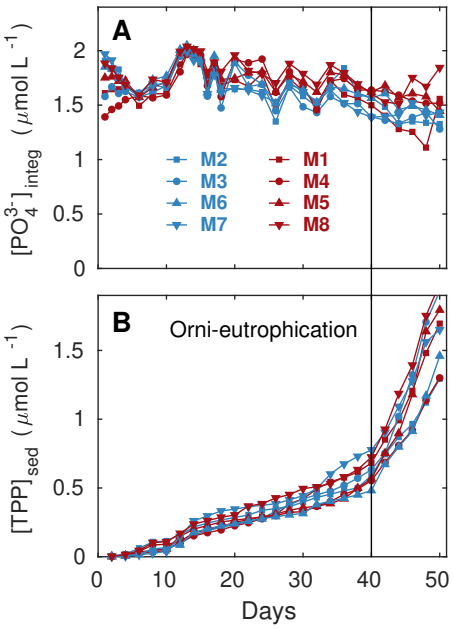


**Figure S2.** Temporal evolution of depth-integrated (0-17 m) phosphate concentrations in the mesocosms (**A**), together with total particulate phosphorus (TPP) accumulating in the sediment traps (**B**). The black vertical line marks the onset of orni-eutrophication. Blue and red colours denote the 'low N/P' and 'very low N/P' deep water additions, respectively (see section 2.2 for details) in the various mesocosms (M1-M8).

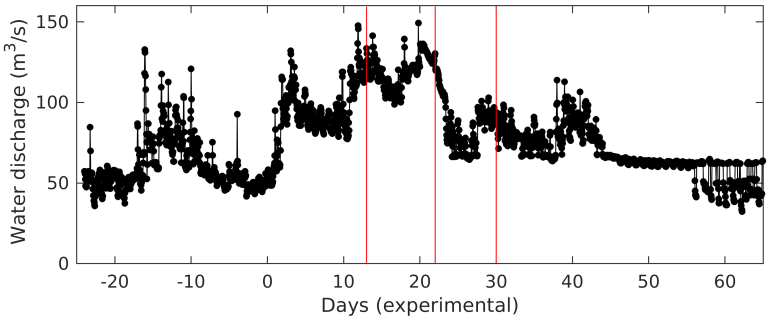


**Figure S3.** Water discharge rates at station Chosica in the Rimac, $\sim$ 45 km upstream the river mouth, and the latter being $\sim$ 5 nm from the mesocosm mooring site. Red lines denote experimental days at which significant reductions in surface water salinities around the mesocosms were measured (compare Fig. 2). Note that the third measured surface freshening does not seem to coincide with such high discharge rates as for the first two. The freshwater could therefore stem from the River Chillón, $\sim$ 9 nm to the North.

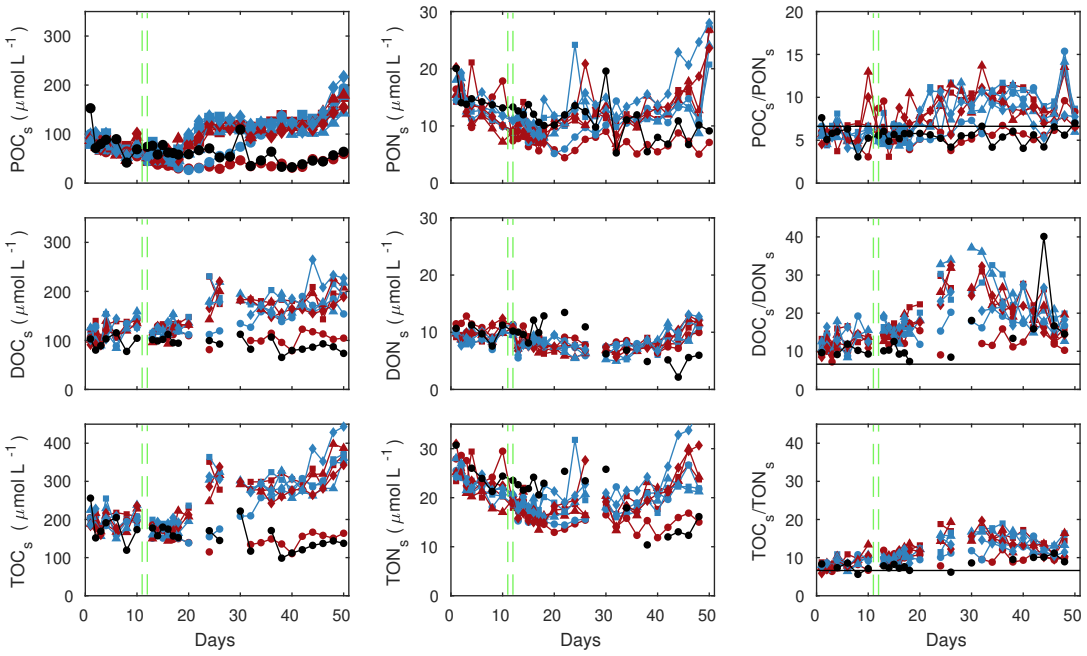


**Figure S4.** Particulate, dissolved and total organic carbon and nitrogen in the mesocosms' surface waters, and resulting ratios. Style and colour code follow those shown in Fig. S2, while black shows data for the surrounding Pacific

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