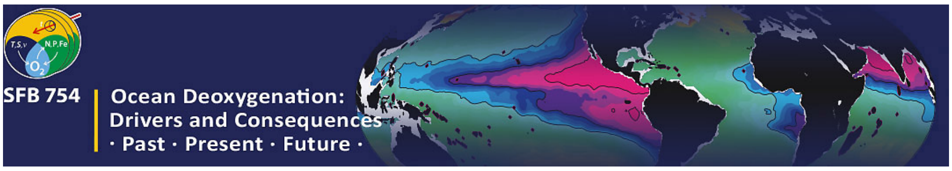

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Regulation of N2O production by oxygen and organic matter in the ETSP

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Oceanic N2O emissions to the atmosphere represent up to 35 % of the global natural sources, and oxygen minimum zones (OMZs) are the major sites for net N2O production. In order to understand what controls net N2O fluxes, and whether the magnitude of N2O production might change in response to global climate and environmental change, it is necessary to determine the factors that influence the major microbial pathways (nitrification and denitrification). The potential niche overlap of nitrifiers and denitrifiers in OMZs makes it difficult to distinguish between these two N2O sources. We used a combination of qPCR and functional gene microarrays targeting, nirS gene for denitrification and amoA gene for ammonium oxidation, to access how the abundance and structure of the community impacts N2O production rates. The influence of natural and manipulated oxygen gradients and particulate organic matter on the regulation of different marine N2O production pathways was investigated in the Eastern Tropical South Pacific (ETSP) using 15N tracer incubation techniques. Highest N2O production rates from nitrate - up to 11.7 0.9 nM N/d - occurred at the oxic- anoxic interface. Oxygen inhibited N2O production from nitrate, nitrite and ammonium. The addition of in situ particulate organic matter stimulated N2O production from nitrite and nitrate by a factor of up to 5.1 and 3.4 respectively. Denitrification is a major source of N2O in the OMZ of the ETSP. Hence, in the coastal area off Peru, short-term variability in oxygen concentrations and increased organic matter flux leads to imbalances in N2O production vs. consumption processes, which may result in high net N2O flux.

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