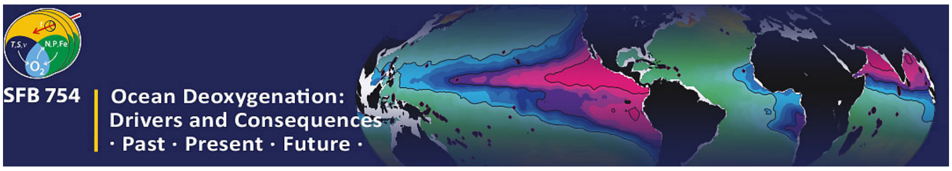

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Isotopic fingerprints of benthic nitrogen cycling in the Peruvian oxygen minimum zone

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Stable isotopes (14,15N, 16,18O) of dissolved inorganic nitrogen (N) were measured in sediment porewaters and benthic flux chambers across the Peruvian oxygen minimum zone (OMZ) from 74 to 1000 m water depth. Sediments at all locations were net consumers of bottom water NO3-. In waters shallower than 400 m, this sink was largely attributed to dissimilatory nitrate reduction to ammonium (DNRA) by communities of filamentous nitrate-storing bacteria (*Marithioploca* and *Beggiatoa*) and to denitrifying foraminifera. The δ15N of their collective intracellular NO3- pool was >30 ‰. The apparent N isotope effect of benthic NO3- loss was 7.4 ± 0.7 ‰ at microbial mat sites and 2.5 ± 0.9 ‰ at the lower fringe of the OMZ (400 m) where foraminifera were abundant. Model simulations of the data generally support a previous hypothesis (Prokopenko et al., 2013) attributing the 15NH4+ enrichment to a close coupling of DNRA and anammox (DAX) using NO2- supplied by *Marithioploca* and NH4+ form the porewater. The model predicts that 40 % of NO3- actively transported into the sediment by *Marithioploca* is lost as N2 by DAX. This enhances N2 fluxes by a factor of 2 – 3 and accounts for 70 % of fixed N loss to N2. By limiting the flux of 15NH4+ back to the ocean, DAX tends to decrease overall benthic N fractionation. Knowledge of the sink of NH4+ once it leaves the sediment is critical for understanding how the benthos contributes to the N isotope effect in the water column.

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