

# **The role of oxygen in biogeochemical and microbiological processes in OMZs**

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Oxygen minimum zones (OMZs) are major sites of fixed nitrogen loss in the ocean. Recent studies have highlighted the importance of anaerobic ammonium oxidation, anammox, in pelagic nitrogen removal. Sources of ammonium for the anammox reaction, however, remain controversial, as heterotrophic denitrification and alternative anaerobic pathways of organic matter remineralization cannot account for the ammonium requirements of reported anammox rates. We explored the significance of microaerobic respiration as a source of ammonium during organic matter degradation in the oxygen-deficient waters off Namibia and Peru. Experiments with additions of double-labelled oxygen revealed high aerobic activity in the upper part of the OMZs. This aerobic respiration under apparently anoxic conditions hints at efficient exploitation of vertically and laterally advected, oxygenated waters as well as in situ O<sub>2</sub>-production in this zone by aerobic microorganisms. In accordance, metagenomic and metatranscriptomic analyses identified genes encoding for aerobic terminal oxidases and demonstrated their expression by diverse microbial communities, even in virtually anoxic waters. Our combined results indicate that microaerobic respiration associated is a major mode of organic matter remineralization and source of ammonium in the upper OMZs.