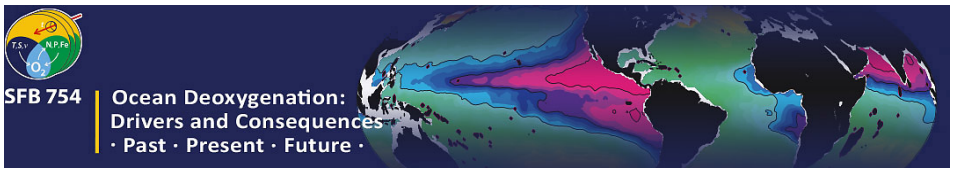

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Anaerobic methane oxidation is an important sink for methane in the ocean's largest oxygen minimum zone

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The eastern tropical North Pacific (ETNP) harbours the largest of the oceans' three major oxygen minimum zones and is further characterized by what appears to be the largest open-ocean accumulation of methane, with peak concentrations located in the anoxic core. Benthic methanogenesis is a major methane source in the ETNP OMZ but it remains unknown to which extent methane is cycled within the OMZ or released to the surrounding oxic waters, thus representing a source of methane to the atmosphere. However, the recent discovery of transcriptionally active bacteria closely related to the anaerobic methanotroph "CandidatusMethylomirabilis oxyfera" of the NC10 clade in OMZs, suggests that the OMZ methane pool might be more dynamic than previously recognized.
We measured methane oxidation rates in anoxic incubations of ETNP OMZ waters using tritium-labelled methane. The highest rates were found at depths intermediate between the secondary nitrite maximum and the deeper peak in methane concentrations within the OMZ core. By contrast, activity was at or below detection in the lower oxycline and at the oxic/anoxic interface. In oxygen addition experiments the process was inhibited by low micromolar oxygen concentrations, which further indicated an anaerobic metabolism, possibly performed by nitrite-dependent NC10 bacteria. The rate constant of anaerobic methane oxidation was approx. 0.3 y-1. Given available estimates of water residence time, this implies that anaerobic methane oxidation is a substantial methane sink in the ETNP OMZ and hence attenuates the emission of methane from this and possibly other oxygen minimum zones.

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