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Offshore transport of a key sulfur oxidizing bacteria from the SUP05 clade sustains 'cryptic sulfur cycling' in the the oxygen minimum zone of the Peru Upwelling

Members of the gammaproteobacterial clade SUP05 couple water column sulfide oxidation to nitrate reduction in sulfidic oxygen minimum zones (OMZs). Their abundance in offshore OMZ waters devoid of detectable sulfide has led to the suggestion that local sulfate reduction fuels SUP05 mediated sulfide oxidation in a so-called 'cryptic sulfur cycle'[1]. We examined the distribution and metabolic capacity of SUP05 in Peru Upwelling waters, using a combination of oceanographic, molecular, biogeochemical and single-cell techniques, and thus obtained the first direct data on the in situ activity of a sulfide-oxidizing, nitrate reducing organism of importance in OMZ waters. A single SUP05 species, *Uncultured Thioglobus perditus*, was found to be abundant and active in both sulfidic shelf and sulfide-free offshore OMZ waters. Our combined data indicated that mesoscale eddy driven transport led to the dispersal of *U. T. perditus* and elemental sulfur from the sulfidic shelf waters into the offshore OMZ region. This offshore transport of shelf waters provides an alternative explanation for the abundance and activity of sulfide-oxidizing denitrifying bacteria in sulfide-poor offshore OMZ waters.

[1] Canfield et al., (2010) A cryptic sulfur cycle in oxygen-minimum-zone water off the Chilean coast. *Science*, 330, 1375-1378.

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