



Expansion of the denitrification regime in the Eastern Tropical North Pacific over the last 40 years

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The Eastern Tropical North Pacific (ETNP) is a large region of anoxic water that hosts widespread water column N loss (denitrification). Climate models indicate that total water column N loss may vary with change volume of low-O₂ waters and the depth of the thermocline, as influenced by climate variability, particularly the Pacific Decadal Oscillation. But, long-term studies of water-column denitrification within the anoxic zone are lacking. In addition, there is some disagreement on whether anoxic zones are currently expanding. In this study, we compared hydrographic measurements, O₂, and water column dissolved inorganic nitrogen (DIN) data from the ETNP in 2012 to data from the same transect in 1972, 1994, and 2007. We show that geochemical markers for cumulative N loss indicate denitrification was highest in 2012. Low oxygen conditions have expanded into shallower isopycnals from 1972 to 2012. Oxygen and N loss changes in the world's largest ODZ for 2007 and 2012 could not fully be explained by climate variability. Finally, any increase in N loss due to vertical expansion of anoxia should be muted by a negative feedback on productivity.