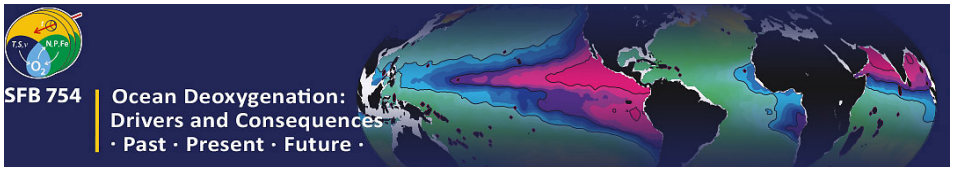

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Long term variability in the denitrification rate in the eastern tropical North Pacific

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As a consequence of global warming oxygen saturations in will increase due to decreasing oxygen solubility and potential changes to biological and physical processes. There is strong observational evidence that deoxygenation has occurred over the last 50 years or so, at least in certain areas. When oxygen concentrations reach very low levels organic matter oxidation proceeds via denitrification, where the terminal electron acceptor for oxidation of organic matte becomes nitrate and nitrogen gas is an end product. Marine fixed Nitrogen, mostly NO3 + PON, controls the fertility of the ocean, and it's concentration is controlled primarily by the balance between the input from biological nitrogen fixation of nitrogen gas and the loss by denitrification. Today, roughly half of the loss by denitrification takes place in the oxygen deficient zones (ODZs) of the eastern tropical pacific and Arabian Sea. Thus, if in the future these areas expand or new ones form then the denitrification losses should also expand with consequences for the altering the marine fixed nitrogen balance and ocean productivity. Is there any observational evidence that has already begun happening? One indicator of denitrification is parameter N, *a stoichiometric parameter calculated from nitrate and phosphate. When N* is negative denitrification is assumed to have occurred and the more negative the value the more denitrification. Here we analyze data from 6 cruises through the core of the ODZ in the eastern tropical North Pacific on a section between 23 and 14 degrees N-latitude along 110 west longitude (WOCE P18). The cruises occurred in 1972,1994, 2007, 2012, 2016, and 2016-17. We integrated the N*values in the ODZ for each cruise over the entire section. The results showed that integrated N* has decreased over the 50 year period. That decrease suggest either denitrification rate increased or the balance between water residence time within the ODZ and organic matter oxidation shifted, or possibly some combination of both. We discuss potential mechanisms for denitrification signal increase including ENSO, Pacific Decadal Oscillation, tropical hurricane intensity, and variations in thermocline depth.

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