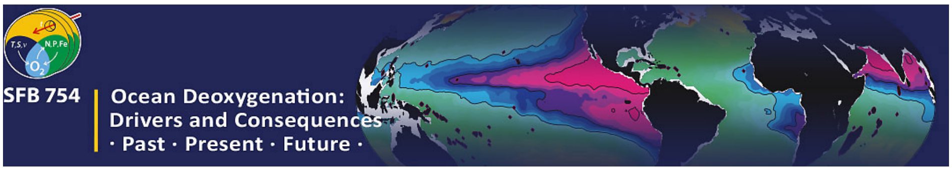

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Pathways and variability of N2O emissions in the Pacific Ocean

Thursday, 6 September 2018 17:00 (15)

N2O is a potent greenhouse gas and a major sink for stratospheric ozone. About a third of atmospheric N2O originates in the ocean, with the Pacific accounting for as much as half of all oceanic N2O emissions. However, little is known about the variability of this flux. Part of the challenge lies in the difficulty of disentangling the multiple, and sometimes simultaneous pathways that produce and consume N2O in the ocean interior, and the circulation features responsible for its outgassing. Ocean biogeochemical models can shed light on these processes; however they typically rely on crude parameterizations of N2O production, and are too coarse to represent important scales for N2O cycling and transport. In contrast, we build a process-based model that represents known pathways of N transformation that are relevant to N2O cycling, using environmental dependencies that reflect microbial physiology. We optimize the model in a 1D advection-diffusion framework by using recent tracer and rate measurements. This optimized solution is incorporated into an eddy-resolving, Pacific-wide ocean circulation model with enhanced resolution over eastern boundary upwelling regions, driven by atmospheric reanalysis. This model allows us to parse the contribution of different N-cycle pathways to oceanic N2O production and outgassing, and to investigate their temporal variability, for example as driven by the El Niño-Southern Oscillation.

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