# Oceanography Seminar*

## "A tale of two oceans: Nitrogen dynamics at the Hawaii and Bermuda Time-series Stations"

*The ocean's harbor a dizzying diversity of microbial life. One class of surface-dwelling ocean life forms, called diazotrophs, are able to fix nitrogen out of thin air, metaphorically speaking. These are essentially the cover crops of the ocean; they are capable of adding 'new' nitrogen to the upper ocean that can fuel carbon export into the mesopelagic. This talk will cover what we know about these organisms and the controls of their activity at the sentinel time-series station of the North Pacific subtropical gyre: Station ALOHA. For additional context, the findings will be compared with findings regarding nitrogen fixation and related nitrogen cycle processes in the subtropical North Atlantic.*

**Thursday, April 18, 2024, 3:00p.m., MSB 100**


## Angelicque White[1] & Daniel D. Sigman[2]

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The Hawaii Ocean Time-series (HOT) program has provided near-monthly data detailing changes in biogeochemical stocks and rate processes in the eastern portion of the North Pacific Subtropical Gyre (NPSG) since October 1988. At the onset of this program, the community recognized that cyanobacterial N2 fixation may be a significant source of new nitrogen that could support production and particle export in the absence of obvious external N sources. Regular, depth-resolved in situ N2 fixation rate measurements were instituted in 2005 and have continued unabated through 2024. This climatology of N2 fixation rates reveals average rates in the upper euphotic zone of ~ 5 nmol N L-1 d-1, with some summer events nearing rates of 10 nmol N L-1 d-1. In the summer of 2022, we measured N2 fixation rates in multiple locations in the region that were up to 4 times higher (~ 20 nmol N L-1 d-1) than the summer mean for the HOT program. These represent some of the highest rates ever measured in the NPSG. What processes explain the elevated rates of N2 fixation during this period and do they coincide with enhanced export fluxes? Are these high rates expected to be more common in the future? The first portion of this presentation will explore the significance of elevated N2 fixation events within the broader context of nitrogen cycling in the NPSG. The second portion of the presentation will focus on the nutrient-poor subtropical and tropical waters of the North Atlantic Ocean which have been intensively studied at the Bermuda Atlantic Time-series Station (BATS). From work at

BATS, mysteries have arisen regarding the rate of biological “export production,” the flux of organic carbon out of surface waters that drives the ocean’s biological carbon storage. The known mechanisms of nutrient supply (such as N2 fixation) are inadequate to fuel the measured rate of carbon removal from surface waters due to export production. Moreover, the known routes of carbon export (such as particle sinking) cannot account for the rate of carbon removal. These coupled mysteries will be probed from the perspective of the upper ocean nitrogen cycle at BATS, and the findings will be compared with those from the North Pacific.

Schedule of upcoming seminars: Thursdays, 3:00pm, MSB 100

***Special Extended Seminar**