In a vast ocean, studying impact of the tiniest creatures

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Vast portions of the oceans contain low levels of the nutrients that normally sustain life. Yet these areas are not devoid of life. Once thought to be biological deserts, recent research has shown that such nutrient-poor marine systems could significantly contribute to the amount of carbon dioxide that is trapped into the deep ocean, influencing Earth's climate. It is critical to improve our understanding of the biogeochemical functioning of these vast ocean environments, in order to accurately predict their evolution in the context of climate alteration.

The OUTPACE project (Oligotrophy from Ultra-oligoTrophy PACific Experiment), led by Thierry Moutin and Sophie Bonnet at the Mediterranean Institute of Oceanography in France has two aims:

To characterize the biogeochemical functioning and biological diversity of the Southwest Pacific along a gradient of nutrient availability, and

To produce a detailed study of the biological production (the quantity of energy that is converted to organic substances by photosynthetic organisms) and its subsequent fate in three contrasting sites, with emphasis on the production sustained by microorganisms capable of fixing dinitrogen (N2).

The video above describes the research cruise they took in 2015. Using data collected during the OUTPACE cruise, onboard the R/V L'Atalante, scientists will determine whether biological production, its transformation to nutrients and its export into the deep ocean are different at these three contrasting sites, and if so, determine how these differences are related to the diversity and functioning of N2-fixing organisms in the planktonic community. Comparing different sites, along a zonal gradient of variable nutrient availability, should provide the OUTPACE scientists with a new insight for identifying and understanding the fundamental interactions between marine biogeochemistry and ecosystems.

I am an assistant research professor at the Lamont-Doherty Earth Observatory of Columbia University and was invited to join the OUTPACE scientific team and participate in the OUTPACE cruise (Feb. 18 to April 3, 2015). I was funded by a National Science Foundation grant (OCE 1434916) to investigate the role of light in the utilization of organic substances by small-sized cyanobacteria (also called picocyanobacteria).

These microorganisms are the most abundant photosynthetic microbes in the ocean and are major drivers of productivity and contribute substantially to nutrient cycling. Thus, defining the mechanisms that control picocyanobacterial abundance, diversity and function is essential to characterizing their contributions in current and future oceans. The ability of unicellular cyanobacteria to utilize organic substances and its modulation by light and nutrients availability will provide additional hints about the ecological success of these microorganisms in the ocean.

Results from the Duhamel Lab project are being analyzed: Stay tuned! For more information, visit the Duhamel Lab webpage.

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