Oceanography Seminar

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C-MORE

Post-Doc

"Mesoscale Biogeochemical Variability North of Hawaii"

Mesoscale motions in the ocean influence the structure and function of pelagic ecosystems through different mechanisms, but a comprehensive understanding of their ecological impact is still missing. In this talk, I will describe the mesoscale biogeochemical variability observed north of the Hawaiian archipelago from 1) a retrospective analyses of the Hawaii Ocean Time-series, and 2) preliminary analyses on targeted observations from mesoscale eddies of different polarity.

The comparison of twenty-three years of satellite observations and biogeochemical measurements from Station ALOHA shows that sea surface height controls the depth of isopycnal surfaces and is associated with numerous biogeochemical changes in different layers of the water column. In waters below ~100 m depth, increases in sea surface height are associated with increases in organic matter and decreases in inorganic nutrients, consistent with predicted consequences of the vertical displacement of water layers. At the depth of the chlorophyll maximum, increases in sea surface height are associated with decreases in vertical gradients of inorganic nutrients and in the abundance of eukaryotic phytoplankton. Above the chlorophyll maximum, dissolved phosphorus enigmatically increases with sea surface height, despite the depression of nutrient-rich, deep waters.

On the one hand, the observations from targeted sampling of mesoscale eddies using ships and autonomous profilers confirm some of the results from the retrospective analysis of the Hawaii Ocean Time-series. On the other hand, optical and acoustical measurements from these cruises captured marked ecological differences between cyclonic and anticyclonic eddies that were not evident from filtration-based measurements.

These analyses show that mesoscale dynamics cause predictable changes in the ecosystem of the North Pacific Subtropical Gyre, and that mesoscale motions are inextricably linked to ocean biogeochemistry and microbial dynamics.

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