Applied Mathematics COLLOQUIUM: Sinking Particles in The Ocean

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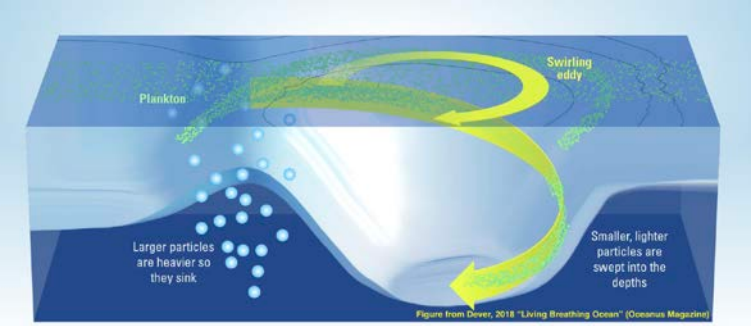
Date:
9/25/2020

Time:
3:00 PM - 4:30 PM

Link:
Please email snsgradstaff@ucmerced.edu for Zoom link and passcode

About The Speaker:

Ambala Mahadevan is a Senior Scientist at the Woods Hole Oceanographic Institution (WHOI) and faculty in the MIT/WHOI Joint Program in Oceanography. She received her Ph.D. from Stanford University and was a postdoctoral scientist at the University of Chicago. Her interests lie in exploring physical processes that shape the oceanic environment, particularly those that affect biological processes and the oceanic carbon cycle with which the earth's climate is so intrinsically linked. She has pioneered the understanding of submesoscale dynamics, fronts and eddies in the upper ocean using models that she developed, along with oceanic observations from research expeditions. Amala is the Faculty Dean of Mather House, one of the 12 undergraduate houses at Harvard University that is home to 400 upperclassmen. She is a recipient of the Radcliffe fellowship in 2015, MIT's Frank E. Perkins award for excellence in graduate advising in the School of Science in 2019, and the Arnold Arons award at WHOI for excellence in teaching, advising and mentoring in 2020. She leads an active federally funded research program and teaches and advises students in the MIT/WHOI Joint Program.



Abstract:

The oceans have taken up about one-third of the carbon dioxide emitted from the burning of fossil fuels to date. Photosynthesis by phytoplankton, production and aggregation of particulate organic matter (or marine snow), and the sinking or "export" of these particles is what contributes to the sequestration of carbon at depth. In this talk, I will present an idealized mathematical model for the sinking flux of shrinking particles of organic carbon as a function of depth. Our model demonstrates that the efficiency of particle export, which is a measure of how deep the particles are exported, depends on the particle size spectrum, density, and the rate of dissolution of the particles. The model reproduces the characteristics of the particle flux depth-profile and its variations as observed in the oceans. In a dynamic flow field, the small, slowly sinking particles can be advected by the flow during their descent. By modeling the oceanic flow field in the Pacific, we demonstrate that the export of slowly sinking particles is affected by the flow field, which can significantly affect the export flux of carbon to depth.

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