

Seminar Talk

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3:00 p.m. KH 224

Title: Exploiting In Situ Lidar to Retrieve Particle Distributions and Characteristics of The Upper Ocean

Abstract:

Passive Ocean color remote sensing has revolutionized our ability to quantify horizontal patterns of phytoplankton distributions across the ocean surface. Lidar technology, which has already proven its ability to produce high resolution models of bathymetry/topography, offers to provide critical insights into the vertical distribution of optical properties and suspended particles, significantly improving our ability to model biogeochemical processes in the upper ocean. We constructed a ship-based lidar system to measure laser backscattering and linear depolarization profiles in natural waters. The instrument was deployed at stations in the coastal mid-Atlantic ranging from estuarine to oceanic conditions, and across the Gulf of Maine. The instrument identified layers with different backscattering intensity in stratified waters of the coastal Mid-Atlantic, and produced system attenuation coefficients (K_{sys}) approximating the absorption coefficient [$a(532)$]. The linear depolarization ratio was strongly related to in situ measurements of bb/b . This information was used to generate a section map of K_{sys} and bb/b across the Gulf of Maine that corresponded well to simultaneous in situ observations performed aboard the M/V Nova Star and an autonomous glider deployed along the ship track. We are now investigating the effect of particle composition on return signal depolarization and developing wavelength-tuning capability for the instrument. These results, in conjunction with data from bench-top laboratory experiments and Monte Carlo simulations of various ocean environments support the proposition that full waveform lidar can provide a powerful but simple-to-operate tool for measuring and monitoring optical properties and particle distributions in the upper ocean.

Bio:

Dr. Richard Zimmerman is a Professor in the Dept. of Ocean, Earth, and Atmospheric Sciences, Old Dominion University. He obtained his BS, MS, and PhD degrees in Biological Sciences from University of Southern California, in 1975, 1979, and 1983, respectively. His research interests are in the area of ecological physiology of marine photosynthesis, metabolic regulation of carbon and nutrient dynamics in marine ecosystems, radiative transfer and remote sensing of optically shallow waters, ecosystem productivity and numerical modeling.