INHERENT OPTICAL PROPERTY VARIABILITY OF A REEF ENVIRONMENT

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ABSTRACT

Inherent optical properties were examined throughout the barrier reef at Kaneohe Bay, Hawaii. Absorption and beam attenuation coefficients were measured 47 times, on calm days in five different reef zones (fore-reef, reef flat, back reef, sand bar, and lagoon). Spectral absorption coefficients and beam attenuation coefficients at 440 nm showed large amounts of variability, ~0.03-0.14 m^{-1} and ~0.1-2.9 m^{-1} respectively. These values imply that Kaneohe Bay optical properties are significantly higher than those found in the Bahamas, but are more similar to those found in Tahiti. Analysis showed Kaneohe Bay to be a scattering dominated environment with absorption dominated by CDOM and detritus. Differences in scattering and absorption were evident inter- and intra-zonally, with generally greater attenuation in the shallow reef flat, lagoon, and northern reef locations. There was no doubt that environmental factors (e.g., wind, waves, and tidal flux) influenced overall attenuation, but even within 24 hours, under nearly identical conditions, beam attenuation doubled and decreased by 50% on the reef flat and in the lagoon, respectively. This shows that optical properties in shallow water environments are highly variable over short distances and within short periods of time. Ecologically, this has significant implications for amount of light available for photosynthesis. For remote sensing, this means that one should not assume that the water column is spatially homogeneous.