ABSTRACT

As a core component of the Hawaii Ocean Time-series, the bio-optics program has measured apparent and inherent optical properties of Station ALOHA since 1998. These data include spectra of downwelling irradiance and upwelling radiance, hyperspectral and multispectral absorption and attenuation of particulate and dissolved material, and measurements of particle concentrations and particle size. The temporal resolution of these observations ranges from daily cycles to seasonal and interannual periods. Since 2002, we have paired these data with various regional remote sensing products, including sea surface temperature anomalies, standard chlorophyll products (OC3M) as well as the ocean color index (OCI) algorithm for low level chlorophyll. Here we will present a subset of findings from this rich dataset. Vignettes include time-series of the particle absorption in the upper euphotic zone, the relationship between particle size and primary productivity, and the influence of color dissolved organic matter on chlorophyll retrievals from space.

Phytoplankton pigment absorption

Phytoplankton absorption is measured by two methods: the quantitative filter pad technique (QFT) and using a Wetlabs ac-s deployed on 2-3 casts per cruise. QFT samples have been processed for cruises spanning January 2006 to May 2011. When spectrally averaged, normalized to HPLC chlorophyll, and corrected for internal scattering, we find the chlorophyll specific absorption coefficient to be relatively constant with depth (~0.02 m² mg chl⁻¹) and time albeit clear indications of photoaclimation are evident via seasonal shifts in the shape of normalized absorption spectra.

Remote sensing products

As a component of the HOT bio-optics program we have evaluated various ocean color products including the OC3M, GSM01 and the Hu (2012) Color Index (CI) developed for chlorophyll values < 0.25 mg m⁻³. We find that many standard flags can be relaxed for the CI index which greatly improves regional coverage. However, even thought it is no secret that the CI index contains information on CDOM and Chl, CDOM does not appear to be well correlated to Chl products. Preliminary findings indicate that differences between the CI index and the OC3M algorithm are partially related to regions having low nLw555.

Particle Size Distribution

The HOT optics package has been instrumented to provide particle size distributions via a LISST. These data are available from September 2009 to April 2014 and show clear variability in relative contributions of particle size classes albeit only weak relationships to primary productivity that are confined to depths of 100-125m.