Biological, Chemical & Physical Oceanography:
Raphe Kudela Lab Summary for CIMT Ship Surveys
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Our lab seeks to understand the primary biological response to the changing physical and chemical conditions in the coastal upwelled waters of Monterey Bay. We focus our efforts on microscopic phytoplankton, autotrophic organisms at the base of the marine food chain that are the foundation for the ocean's entire biological community. We collect a variety of biological measurements at sea, as well as measurements used to ground-truth remotely sensed (satellite and airplane) data in our efforts to understand the linkage from wind to whales. We began participating on the CIMT ship survey cruises in August 2002, with regular participation since November 2002. These cruises usually require one to two people from our lab being present on the R/V John Martin, with additional people involved in the laboratory analyses.

Underway Measurements

Our group has contributed to the installation of an underway flow-thru sea surface mapping system on the R/V John Martin. This system consists of an SBE 45 thermosalinograph (a measurement of temperature and salinity), and a SCUFA fluorometer, which measures chlorophyll fluorescence (a proxy for plant biomass) and turbidity (water clarity). Together with Kelly Newton from the Croll Lab, we process the data, repair and calibrate the instruments as needed.

Vertical Profile Measurements

At sea, our lab deploys the CTD/Optics package at eleven stations. The package consists of an SBE 19 CTD, (which measures conductivity, temperature, and depth), a WetStar fluorometer (measurement of chlorophyll *a*), and a HOBI Labs Hydroscat-2 (measurement of optical backscatter).

Discrete Bottle Measurements

We also collect a variety of water samples from niskin bottle(s) deployed at each station. We typically collect water at 5m depth from each station, with the exception of two stations (T100, and T401) where we collect water from additional depths (0m, 10m, and 25m). The samples that we collect are listed below. All of these samples are brought back and processed in our lab at UCSC. These samples all contribute to understanding the role of primary producers in coastal upwelling environments and future modeling efforts of primary and new production in the bay.

- Size Fractionated Chlorophyll *a* (0.7 μm, 1 μm, 10 μm)
- Macronutrients (nitrate, phosphate, silicic acid)
- Colored dissolved organic matter (CDOM)
- Particulate, detrital, and phytoplankton absorption spectra (ap, ad, aph)
- Biogenic silica, lithogenic silica (bSi, lSi)

- Particulate Organic Carbon/ Particulate Organic Nitrogen (POC/PON)
- Total suspended sediments (TSS)
- Flow cytometry (FCM)

Satellite Measurements

We provide satellite imagery from the MODIS Aqua satellite, which measures ocean color and temperature, and NOAA AVHRR satellites, which measure sea surface temperature. For CIMT, we provide daily images, as well as an 8-day average centered on the cruise period. These images are used to help interpret the spatial variability of the Bay during the cruise period.