Bio-optical measurement in the California Current

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General Research Plan and Schedule

We measured the optical and bio-geochemical properties during the autumn 2004 CalCOFI cruise.

Calibration of in situ radiometry instruments

We maintain NIST-traceable calibration of our PRR-800/810 radiometers. SIRREX-linked calibrations for our PRR-800/810 have been accomplished by Biospherical Instruments, Inc. (BSI) and SDSU Center for Hydro Optics and Remote Sensing (CHORS) since May 1993.

Measurement of ocean optics and supporting variables

We deployed our characterized and calibrated instruments during CalCOFI 0411 cruise in November, 2004. It is recognized that AOP including spectral reflectance are more appropriately measured from free fall instrumentation that is independent of the ship's fixed winch cable systems. Freefall methods minimize artifacts due to the ship (shadow, oil slicks, breaking waves, propeller bubbles, etc.). This system will ensure that we are collecting the best possible AOP data set. The PRR-800 includes Eu so that it will have 19-channel optical geometry allowing us to continue our advanced model development. We assisted the CalCOFI program in design and configuration of an inherent optical property (IOP) package. This new instrumentation has been integrated and tested on each CalCOFI cruise in the past year and will continue into the future as a core part of the CalCOFI effort. During CalCOFI 0411 water samples at our optics stations were collected for HPLC pigments, absorption spectra of particles and detritus.

Data has been processed to derive products (K, R_{rs}, E_d, L_u, etc.) at the surface and below the surface using standard methods (Smith and Baker, 1978a and 1978b; Mitchell, 1992; Siegel et al., 1994; Mitchell and Kahru, 1998; Kahru and Mitchell, 1998). We have merged the optical and support data to a data management system. HPLC samples were submitted to the NASA-sponsored laboratory of Dr. Charles Trees of San Diego State University in August 2005. The submittal was delayed because of two reasons: first, SDSU/CHORS changed methods in late 2004/early 2005 and this caused delays in processing many samples submitted in this time frame; second, we had more than 500 samples from Southern Ocean cruises from earlier in 2004 so they

were our first samples processed by SDSU/CHORS once they were back on line for operational analyses. We have been assured by SDSU/CHORS that the data from CalCOFI 0411 will be completed by October, 2005. Once we receive the HPLC, we will finalize the quality control of the flourometric and HPLC pigments, absorption and radiometry, and then submit all data collected as self-documenting data sets to the GSFC SeaBASS archive according to established SIMBIOS format requirements.

Algorithm Development

We have remained a major contributor to the NASA SeaBASS data set, and of the approximately 2000 points being used for the OCBAM bio-optical workshop, we have contributed about 20% of the data. With funds from this project in the past year, we have updated our bio-optical data based under Microsoft SQL and we have developed routines to deliver data to SeaBASS in a more automated way so they can get our updated data. We participated in the OCBAM workshop held in New Hampshire, and applied our own algorithms to the data set, and provided critical input to quality control of their data.

Satellite data analysis for the California Current

We have been developing a system to support various investigators in the analysis of standard satellite products as well as advanced products, including export flux, derived by models. We have generated time-series of chl-a, POC, primary production and export production for the California Current region using our own new models or those available from NASA or other colleagues. The time-series will be analyzed to extend our previous studies of satellite time-series and climate forcing in the Eastern Pacific (Kahru and Mitchell, 2000, 2002). This effort is being utilized by various investigators that are part of the NSF Long Term Ecological Research project we recently began for the California Current Ecosystem. Details of the satellite methodologies, including custom compositing of high-resolution data, and images from the California Current test cases can be found at the following URL:
http://spg.ucsd.edu/Satellite_Projects/Full_res_sat_time_series_California/Full_res_sat_time_series_California.htm

Citations

Kahru, M. and B. G. Mitchell (2000) Influence of the 1997-98 El Niño on the surface chlorophyll in the California Current. Geophysical Research Letters, 27(18): 2937-2940.

Kahru, M. and B. G. Mitchell (2002) Influence of the El Nino –La Nina cycle on satellite-derived primary production in the California Current. Geophysical Research Letters 29(17), 27-1-28-4.