

## Quarterly Progress Report

July - September 1997

Mark R. Abbott  
College of Oceanic and Atmospheric Sciences  
Oregon State University

MODIS Team Member, Contract # NAS5-31360

### Near-Term Objectives

- Continue analysis of Hawaii Ocean Time-series (HOT) bio-optical mooring data, and Southern Ocean bio-optical drifter data
- Begin development of documentation of MOCEAN algorithms and software for use by MOCEAN team and GLI team
- Deploy instrumentation for JGOFS cruises to the Southern Ocean
- Participate in test cruise for Fast Repetition Rate (FRR) fluorometer
- Continue chemostat experiments on the relationship of fluorescence quantum yield to environmental factors.
- Continue to develop and expand browser-based information system for in situ bio-optical data

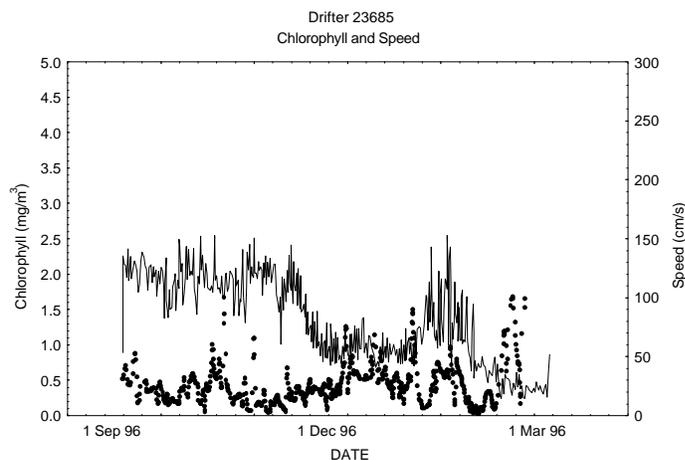
### Task Progress

#### 1) Analysis of HOT mooring data and drifter data

We presented some initial results from the bio-optical mooring in our Semi-Annual report last July. We are continuing to analyze these data. Briefly, a dramatic shift in the chemical environment occurred at the HOT mooring north of Oahu. Dissolved nitrogen levels increased in the upper ocean by nearly two orders of magnitude, followed by a sharp increase in chlorophyll concentration and primary productivity. Although we initially suspected a mesoscale eddy, analysis of the NSCAT vector wind record revealed a close correlation between Ekman pumping (driven by time-variations in the wind stress curl) and changes in the chemical and bio-optical properties of the water. We have quality-controlled all of the bio-optical data, eliminating those with suspect values. We are presently analyzing the diel patterns of sun-stimulated fluorescence. We expect to submit at least one manuscript by the end of the calendar year.

We have begun analysis of the three bio-optical drifters that were deployed last year in the Southern Ocean. All of the data have now been quality-controlled. Chlorophyll

concentrations have been calculated, and backscattering corrections have been applied to the sun-stimulated fluorescence measurements. The values are within expected ranges, although fluorescence per unit chlorophyll is quite variable in the initial part of the drifter tracks (in the western region) and becomes more constant as the drifters move east along the Pacific/Antarctic Ridge. The figure below shows a plot of chlorophyll and drifter speed from one of the drifters. The area of increased chlorophyll near the end of the deployment occurred in the vicinity of the Eltanin Fracture zone where the bottom topography is rugged and the drifter became entangled in several small eddies. We are now examining the patterns of diel variability. A paper will be presented on these results at the 1998 Ocean Sciences meeting in February.



All of these bio-optical measurements have been provided to Bob Evans and to NASDA for OCTS validation, and to Robert Frouin for POLDER validation. We expect that the Southern Ocean data will be of particular interest because of the scarcity of sampling in that region of the world ocean.

## 2) MOCEAN algorithms documentation

Jasmine Bartlett has reviewed all of the MOCEAN ATBDs and spent one week in Miami working with Bob Evans and his programming team. She is now assembling all of this material plus other available documentation to produce a comprehensive guide to the MOCEAN processing system. This document will give a brief overview of the scientific “structure” of the algorithms, and then provide a detailed roadmap of how the various components are linked together. This material will not replace the documentation being developed for the ECS but rather will be aimed at the interested science user. A Web-ready version of this document is also being prepared. We expect to have a rough draft ready for review by the MOCEAN team later this year. This document will also serve as our primary deliverable (along with a copy of the MOCEAN software) to the GLI team.

## 3) JGOFS cruise preparations

Approximately 11,000 pounds of equipment was shipped to New Zealand in preparation for the first survey cruise of the Polar Front this October. We will be deploying 12 bio-optical moorings (which will be recovered in March 1998) and twenty drifters (10 bio-optical and 15 surface velocity drifters). Ten more drifters will be deployed in January 1998. All of the mooring equipment was assembled and tested this past summer. Each mooring includes a Satlantic irradiance sensor and data logger, and an Oregon Environmental Instruments current meter and data logger. Six of the moorings also include a SeaBird Microcat conductivity/temperature sensor and data logger. We refurbished acoustic releases so that the entire sensor package will be recovered. We tested the 0.14" jacketed Kevlar cable which serves as the primary mooring line. The breaking strength of this lightweight cable is sufficient to handle the force that will occur when the two, 700 pound railroad wheels are deployed as anchors. The total cost of each mooring is less than \$20,000.

#### 4) Test of FRR fluorometer

We received the FRR fluorometer from Chelsea Instruments (nearly two years late) and tested it on a cruise off the Oregon coast. While the sensor performed properly, there were numerous glitches in the software, and some of the connectors need to be redesigned. We have spoken with Chelsea and the instrument will be shipped back to the United Kingdom for modification. Unfortunately, this means that the FRR fluorometer will not be available for the first survey cruise, but it should be back in time for the second survey cruise in January.

#### 4) Chemostat experiments

We have begun our chemostat experiments to investigate the links between fluorescence quantum yield, nutrient and light stress, and primary productivity. We have made some minor modifications to the chemostat which we are borrowing from Dr. Dale Kiefer (USC). We expect to report more detailed results in our next semi-annual report.

#### 5) Browser and data base development

We have installed a 1 terabyte RAID system in anticipation of the delivery of SeaWiFS data this fall and MODIS data next summer. This system has undergone testing and has been successfully incorporated into our Microsoft SQL Server data base system. We have extended the data base and browser to include tools for extracting surface observations from drifters and moorings and overlaying them on satellite imagery. We are redesigning the browser interface to take advantage of new capabilities available in Microsoft Internet Explorer 4.0 and Netscape Communicator 4.0. Our tool development is based on both DCOM (Distributed Component Object Model) and Java, although we are now adding CORBA-compliance to our Java tools.

## Anticipated Activities

### 1) Bio-Optical Mooring and Drifters

We will deploy moorings and drifters in the Southern Ocean in October. Our bio-optical mooring in Hawaii will be recovered in November. After servicing, we will redeploy it. We have built a second sensor package so that there will be no time gaps between recovery, servicing, and redeployment.

### 2) Laboratory Work

We will continue the chemostat experiments on fluorescence quantum yield and primary productivity.

### 3) Information Management

We will continue to develop Web-based browser and data analysis systems for the drifter data base and the satellite imagery data base.

## Problems/Corrective Actions

Approvals for purchases have improved somewhat, but are still taking nearly 5 weeks. Increasing the threshold to \$5000 would greatly simplify matters and would bring the system into conformity with other Federal regulations that define equipment as costing over \$5000. We have overspent our FY97 allocation and anticipate rapid provision of FY98 funds.