Quarterly Progress Report

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Near-Term Objectives

- Deliver revised quality flags for our data products, based on input products from other MODIS researchers
- Revise the MOCEAN validation plan
- Submit manuscripts on bio-optical scales and fluorescence quantum yields in the California Current
- Hire a postdoctoral level person to serve as point of contact for MOCEAN and GLI activities
- Acquire instrumentation and facilities in support of upcoming JGOFS cruises to the Southern Ocean
- Continue chemostat experiments on the relationship of fluorescence quantum yield to environmental factors. Establish relationship between fluorescence quantum yield and photosynthetic parameters
- Continue to develop and expand browser-based information system for in situ bio-optical data

Task Progress

1) Version 2 software

We have sent a more complete explanation of our data quality flags to Bob Evans at the University of Miami. His team is implementing these flags as part of the MOCEAN processing system. After discussions with Evans, we decided against implementing our Fluorescence Line Height (FLH) and Chlorophyll Fluorescence Efficiency (CFE) algorithms as a single piece of code. We decided that code maintenance would be simpler if kept them separate. Therefore our Version 2 code will be the same as our Version 1 code, except for the addition of the data quality flags.

2) MOCEAN validation plan

Based on the reviews of the MOCEAN validation plan, we have discussed revisions with Wayne Esaias. Our role in the plan remains unchanged, except that we will add a

component of aircraft measurements by Frank Hoge. Recent aircraft flights over the Gulf Stream compared the FLH algorithm (although with slightly different wavelengths than MODIS) with the laser-induced fluorescence measurements from the Airborne Oceanographic Lidar (AOL). The AOL and FLH measurements agreed very well over a broad range of conditions. However, the chlorophyll values generally exceeded 1.0 mg m^{-3}, so it will be useful to compare this approach over waters with much lower chlorophyll. Aside from additional work with aircraft measurements, our approach is 1) validate FLH in several "end-member" environments (central gyre, coastal ocean, upwelling system, and high latitude), and 2) characterize temporal and spatial scales of variability.

3) Bio-optical scales

We have a book chapter in press entitled "Going with the flow - The use of optical drifters to study phytoplankton dynamics," which will appear in *Monitoring Algal Blooms: New Techniques for Detecting Large-Scale Environmental Change* (M. Kahru and C.W. Brown, editors). This chapter compiles many of our recent results with bio-optical drifters and chlorophyll fluorescence. We have submitted two manuscripts to a special issue of *Deep-Sea Research* on the California Current. The first manuscript is "Decorrelation Scales of Chlorophyll as Observed from Bio-optical Drifters in the California Current." The second manuscript is "Observations of Fluorescence Quantum Yield from Optical Drifters in the California Current."

The three bio-optical drifters that were deployed in the Southern Ocean last September have now ceased to operate. One of the drifters failed early due to a battery pack malfunction and it will be replaced by the manufacturer. The other two drifters followed a meandering path in the Antarctic Circumpolar Current as it moved northeastward along the Mid Pacific Rise. At the Eltanin Fracture Zone, both drifters became trapped in small eddies associated with the strong ridge and basin topography of the area. We are now analyzing the data from these drifters.

4) GLI interactions

NASDA has provided partial funding for a postdoctoral-level researcher to interact with the MODIS Science Data Support Team, Miami, and the GLI team. We have hired Jasmine Bartlett to fill this position beginning June 1. Ms. Bartlett received her Master's in oceanography from Dalhousie University, working with Shuba Sathyendranath. She has been working the past year with John Cullen and Richard Davis on atmospheric effects as well as the analysis of in-water bio-optical measurements. In addition to her GLI duties, she will make valuable contributions in our analyses of MODIS validation data.

4) Validation instrumentation

We have assembled all of the necessary hardware for our upcoming field program in the Antarctic Polar Frontal Zone beginning in October 1997. We will deploy 12 bio-optical moorings which will be recovered in March 1998. We will also release 30 drifters, 15 of which will be bio-optical drifters. On two cruises (October-November and January-February), we will also deploy the Fast Repetition Rate fluorometer and a new

Tethered Spectral Radiometer Buoy for validation of OCTS and SeaWiFS as well as FLH algorithm development.

5) Chemostat experiments

We have begun our chemostat experiments to investigate the links between fluorescence quantum yield, nutrient and light stress, and primary productivity.

6) Browser development

Our development is continuing long the lines discussed previously. The basic thrust is to build applets that can be used to query data bases (both NT and UNIX-based) as well as provide visualization and analysis capabilities. The goal is to make these platform-independent and to leverage off the enormous amount of off the shelf applications. We have added in the NOAA ocean climatology data base and are building volume visualization applets for viewing these data. We are expanding our data base to handle underway SeaSoar optical data in anticipation of the JGOFS cruises later this year. We will take one of the data base machines on the cruise for near real-time entry of the data. We are beginning discussions with the MOCEAN team about hosting the ocean validation data for MODIS.

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 May. After servicing, we will redeploy it later this summer. We are also building a second sensor package so that there will be no time gaps between recovery, servicing, and redeployment.

2) Laboratory Work

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

3) Information Management

We continue to develop Web-based browser and data analysis systems for the drifter data base and the satellite imagery data base. We may host the MOCEAN in situ validation data as part of the MODIS validation activities.

Problems/Corrective Actions

We are extremely frustrated with the new rules for carryover and the slowness in obtaining GSFC approval for purchasing equipment. Given that NASA is now checking expenditures on a monthly basis, our inability to purchase equipment on a timely basis is hampering our abilities to meet our financial requirements. More importantly, it is nearly impossible to prepare for cruises and validation work when approvals from GSFC are adding two months to our purchase and acquisition time

lines. This must be fixed soon! We also note that the Federal government now considers permanent equipment to be anything with a value over $5000 yet GSFC continues to use $1000 as the cutoff.