# High Resolution Time Series Measurements of Bio-optical and Physical Variability in the Coastal Ocean as Part of HyCODE

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### LONG-TERM GOAL

A general long-term goal of this project is to increase understanding of variability of inherent and apparent optical properties (IOPs and AOPs) and their relationships to each other and to physical processes on the ocean's continental shelves. In addition, the data to be collected during our study and their analyses will expand the usefulness and utility of remotely sensed ocean color data, which will be collected from the Navy's Coastal Ocean Imaging Spectrometer (COIS) to be flown on the Navy Earth Map Observer (NEMO) satellite as part of the Spectral Signatures (Naval Research Laboratory, NRL) program.

### **OBJECTIVES**

Some of the specific objectives of this project are

1. To provide the maximum number of *in situ* observations (highest possible number of match-ups) of IOPs and AOPs possible for calibrating, groundtruthing, and relating subsurface optical properties (algorithm development) to COIS data, and to develop, test, and validate optical models and high resolution interdisciplinary models of the coastal ocean.

2. To study processes which contribute to temporal and spatial (horizontal and vertical) variability of spectral IOPs and AOPs. In particular, we plan to determine how temporal and spatial variability in IOPs and AOPs are affected by:

a) Coastal physical and biological dynamics (upwelling/downwelling, fronts, filaments, eddies, blooms, etc.) and larger scale circulation patterns

b) Wave fields (e.g., tides and surface, internal, and solitary waves)

c) Water column stratification and current shears

d) Near surface and near bottom mixing (e.g., effects on primary productivity, sediment resuspension, dilution, dispersion, etc.)

e) Diurnal and seasonal biological and physical cycles

f) Riverine and runoff inflows (i.e., changes in partitioning of sedimentary, biological, and colored dissolved material (CDM) components, and blooms).

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## APPROACH

Intensive HyCODE field observations are scheduled for the years 2000 and 2001. The particular region of study for this project is the continental shelf off New Jersey where coastal upwelling fronts and internal solitary waves are common features. Our work is part of a large coordinated effort involving several other institutions. We plan to instrument moorings placed on the New Jersey shelf (~30 m depth) with optical instruments to measure IOPs, AOPs, and physical properties with high temporal resolution at multiple depths. These instruments will enhance our capability 1) to groundtruth, validate, and develop new algorithms for the high spectral, spatial resolution satellite imager (COIS), 2) to relate IOPs to AOPs, a fundamental and longstanding problem of ocean optics, and 3) to improve real-time predictions of the underwater light environment and visibility. All three of these points are fundamental to tactical naval applications in the coastal ocean and central to the ONR HyCODE program. Details may be found in Dickey et al. (1999) or on the web site: http://www.opl.ucsb.edu/hycode.html.

### WORK COMPLETED

Planning has been done in preparation for the field experiment in the summer of 2000 and a data management and distribution workshop was convened in preparation for the field observations (Dickey et al., 1999 or web site given above).

### RESULTS

The field program will begin in the summer of 2000, so no results have been obtained yet.

## **IMPACT/APPLICATION**

It is anticipated that results of the project will lead to 1) improved understanding of variability of inherent and apparent optical properties (IOPs and AOPs) and their relationships to each other as well as to physical processes on the ocean's continental shelves, 2) expanded usefulness and utility of high spectral and spatial resolution remotely sensed ocean color data, and 3) more accurate predictive interdisciplinary models of the coastal ocean.

### TRANSITIONS

The results of our work (see impacts above) should be of interest to several levels of the operational Navy, particularly naval operations in the littoral zone.

### **RELATED PROJECTS**

This project builds on the ONR Coastal Mixing and Optics and PRIMER programs. Results of our CMO work have already appeared in the reviewed literature as well as reports and conference proceedings (please see Annual CMO Report). Our HyCODE activity will involve close collaborations with several other HyCODE, Naval Research Laboratory, and LEO-15 scientists.

#### REFERENCES

Dickey, T., S. Ackleson, R. Arnone, P. Bissett, J. Donovan, S. Glenn, W. Hou, W. McBride, O. Schofield, J. Smart, and W. Snyder, Report of the First HyCODE Data Management and Distribution Workshop, Rutgers University, April 12-13, 1999.

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#### PUBLICATIONS

Dickey, T., S. Ackleson, R. Arnone, P. Bissett, J. Donovan, S. Glenn, W. Hou, W. McBride, O. Schofield, J. Smart, and W. Snyder, Report of the First HyCODE Data Management and Distribution Workshop, Rutgers University, April 12-13, 1999.