Chesapeake Bay Cruise 2011: A Report

Date: December 13, 2012

Vessel: R/V Bay Commitment
Location: Chesapeake Bay
NASA FSG Participants: Joaquin Chaves, Scott Freeman, Aimee Neeley, Mike Novak, Jeremy Werdell
NOAA Participants: Michael Ford (NOAA, NMFS; POC), Steve Giordano (NOAA NMFS; captain), Michael Ondrusek (NOAA NESDIS/STAR)
PI: Charles R. McClain

The Ocean Ecology Laboratory Field Support Group (FSG; code 616) participated in a cruise of opportunity aboard the R/V Bay Commitment, a 41-foot, aluminum-hulled vessel based out of Annapolis, Md in November 2011. The vessel supports NOAA field operations throughout the Chesapeake Bay.

This cruise provided an opportunity for NASA to collaborate with NOAA scientists on Chesapeake Bay water quality monitoring. The FSG goals were threefold: (1) to demonstrate to NOAA how in-water optical properties are collected, processed, and interpreted for use in operational satellite ocean color calibration and validation activities; (2) to illustrate how these measurements can be used to enhance existing NOAA water quality monitoring data streams; and, (3) to conduct a radiometer inter-calibration experiment using two Satlantic Hyperpro instruments deployed simultaneously. FSG staff attended a post-cruise meeting with NOAA colleagues at the NOAA Chesapeake Bay Office in Annapolis, Maryland in April 2012.

The ship left port early on November 15, 2011 from Piney Narrows Yacht Haven, Kent Island, MD, just east of the Chesapeake Bay Bridge. Unfortunately the sky conditions were less than optimal for satellite overpass comparisons, but were consistently overcast. The FSG sampled at two Chesapeake Bay Program water quality monitoring stations: St. CB 3.3C and Blade Point.

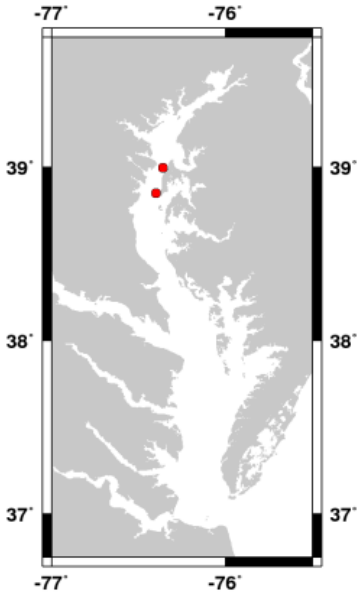
For oceanographic sampling, water was collected from two depths using tubing and a peristaltic pump**.** The tubing was attached to the IOP packages with which water was collected at depth. Water for the measurement of the following biogeochemical parameters was collected from the two stations: High Performance Liquid Chromatography pigments, particulate absorption (a_p), particulate organic carbon (POC), absorption due to colored dissolved organic matter (a_{CDOM}), dissolved organic carbon (DOC), and suspended particulate matter (SPM; See Table 1). Samples for each parameter were collected from the surface (~1m) and the chlorophyll maximum (~10m).

Two Satlantic profilers were deployed simultaneously, one provided by the FSG (Hyperpro) and the other by Michael Ondrusek (Hyperpro). Staff also measured the spectral marine absorption, attenuation, and backscattering coefficients using **two** IOP packages attached together and deployed simultaneously. One IOP package consisted of two WET Labs ac-s instruments (one equipped with a 0.2μm filter) and one bb9. The ac-s measures absorption and attenuation (and total scattering by difference) at ~ 80 wavelengths between 400 and 740 nm, while the bb9 measures backscatter at 9 wavelengths and 117°. The other IOP package consisted of two HOBI Labs instruments, an a-Sphere and a HydroScat-6 and one WET Labs instrument, an ac-9. The a-Sphere measures absorption at ~ 82 wavelengths between 360 and 750nm. The HydroScat-6 measures backscatter at 6 wavelengths and 140°. The ac-9 measures absorption and attenuation at 9 wavelengths between 412 and 715nm. Both downwelling irradiance (E_d) and upwelling radiance (L_u) were measured using the two radiometers, as well as incoming solar irradiance (E_s; hyperspectral). A multi-cast method was used for deploying the radiometers.

The NASA FSG is responsible for processing and submitting their biogeochemical and in-water optical data to SeaBASS. Further work will be conducted to revise QA/QC protocols for data processing that will be accepted and ultimately used by the bio-optical community. The purpose of established QA/QC protocols is to ensure the quality and accuracy of the data that are archived in NASA's SeaBASS database, and are ultimately used not only by other investigators in the community but also by the NASA Ocean Biology Processing Group for performing satellite matchups and algorithm development. To this end, accurate data are imperative. Moreover, the simultaneous deployment of multiple instruments and the collection of both in-water optics and biogeochemical parameters by two independent groups provide a valuable tool

for conducting closure experiments and the development of uncertainty budgets for our measurements.

Tables and Figures:



Map 1: Station locations for Chesapeake Bay cruise.

Parameter	Number of samples collected
HPLC Pigments	8
a_p	8
POC	8
a_{CDOM}	4
DOC	8
SPM	8

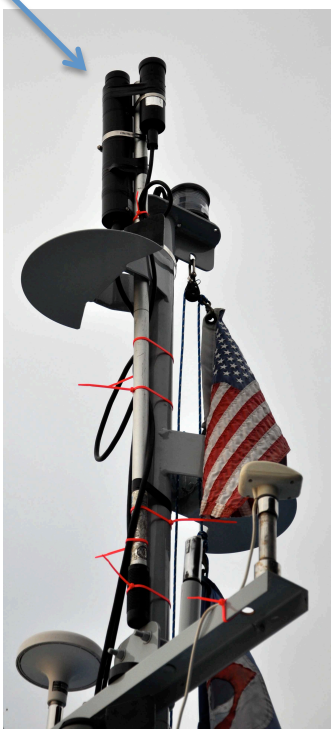
Table 1: Biogeochemical parameters collected during the Chesapeake Bay cruise 2011.

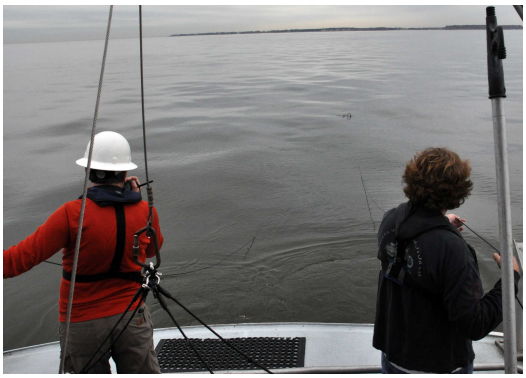
Station	Begin (GMT)	End (GMT)	Latitude (deg)	Longitude (deg)	Depth (m)	Hobi	**WET Labs**	H-Pro	OCR
CB3.3C	14:41	16:31	38.996	-76.360	24	X	X		
CB3.3C	16:53	17:08	38.996	-76.360	24			X	
Blade Point	18:11	18:37	38.849	-76.399	30			X	X
Blade Point	18:58	19:50	38.849	-76.399	30	X	X		

Table 2: Station information and instruments deployed on Chesapeake Bay Cruise, with an X denoting when the instrument package was deployed. Multiple casts were made at each station, with 0.2 μm filters switched between WET Labs ac-s and Hobi a-Sphere instruments. Environmental conditions were consistent throughout the day: 100% overcast; wind < 3 m/s, calm seas. Local noon was 16:48 GMT.

Photo 1: The R/V Bay Commitment; Photo by David Harp, chesapeakephoto.com

E_s Sensors





Bay Bridge

Photo 2: Clockwise: Incoming solar irradiance sensor attached to the highest point of the ship; Scott Freeman and Michael Ondrusek deploying the profilers; Profilers in the water.

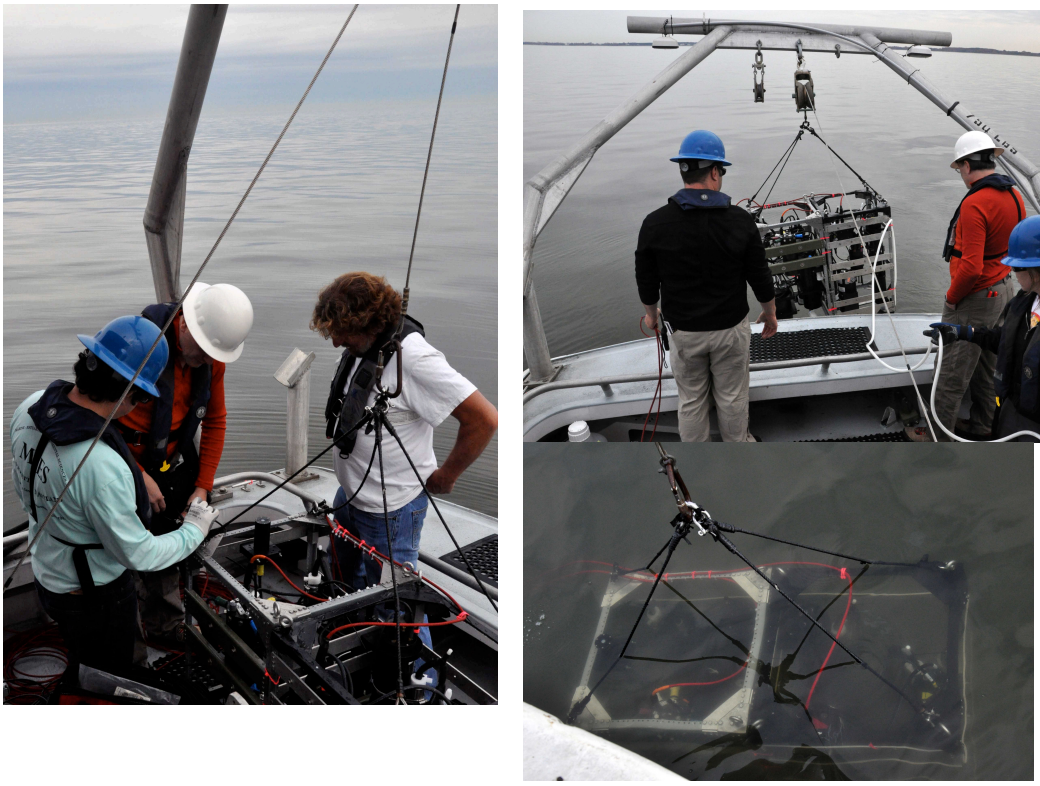


Photo 3: Clockwise: Joaquin Chaves, Scott Freeman and Michael Ondrusek preparing for IOP deployment; Deployment in process, with Jeremy Werdell, Scott Freeman and Aimee Neeley. Note hose for water sampling; IOP packages in the water.

Photo 4: Filtering apparatus; Mike Novak filtering water samples.

Photo 5: Mike Ford (L) and Steve Giordano (R).