Applications of VIIRS Ocean Color for Real Time Adaptive Sampling

Robert Arnone, Ryan Vandermeulen, Inia Soto Ramos, Kevin Martin
University of Southern Mississippi (USM), Department of Marine Science

The Visible Infrared Imaging Radiometer Suite (VIIRS) ocean color time series is providing a real time characterization of the biological and physical processes occurring in the Gulf of Mexico. Daily VIIRS ocean products are being coupled with several ocean circulation models (HYCOM and NCOM) and in situ data from glider and ship, and are integrated together at USM’s Ocean Weather Laboratory. The laboratory is demonstrating the rapidly changing conditions occurring in a river-dominated system and the interaction with the offshore current and eddies. The VIIRS data provide an enhanced capability to support how we define the uncertainty of ocean models and characterize how the ecosystem is responding to the physical processes. The real time data fusion of satellite, models, and in situ observations are providing the capability to adaptively sample the ocean features and processes. A recent “AUV Jubilee” in the Gulf of Mexico demonstrated the operational applications for VIIRS ocean color products to coordinate glider and in situ operations. VIIRS is providing essential products for identifying the river plumes, which can be then targeted for sampling with gliders or other vessels.

**Objectives**

- Establish adaptive sampling for gliders during the AUV jubilee on July 13-17, 2015 and coordinate ocean observing operations in the Gulf of Mexico
- Enable improved ocean sampling strategies to support physical models, satellites, aircraft, and ships
- Couple VIIRS ocean color data with physical models to determine the locations for glider deployment, strategic navigations and safe operations.
- Establish open dialogue and collaboration with scientists among the Gulf of Mexico
- Submit data to the Glider Data Archive Center for assimilation into operational models
- STEM curriculum development and teacher participation in operational oceanography

**Method for Adaptive Sampling**

**Near Real-Time Adaptive Sampling**

**Step1: Assemble data into Google Earth during AUV “Jubilee”**

**Step2: Integrate and compare data**

**Step3: Decision making, validation**

**Step4: Data distribution and coupling**

**Step5: Outreach and public awareness**

**Example from Real Time AUV Jubilee**

Giders can be “guided” to sample specific ocean features of interest (e.g., river plumes) using VIIRS satellite ocean color data and physical circulation models. The integration of VIIRS Chlorophyll-a data with circulation models. Location of glider and Lidar tracks from all the participants during the AUV jubilee event during July 2015.

**Summary**

- The VIIRS data provide an enhanced capability to support how we define the uncertainty of ocean models and characterize how the ecosystem is responding to the physical processes.
- VIIRS validates Models in dynamic River Plumes
- The real time data fusion of satellite, models, and in situ observations are providing the capability to adaptively sample the ocean features and processes.
- A recent “AUV jubilee” in the Gulf of Mexico demonstrated the operational applications for VIIRS ocean color products to coordinate glider and in situ operations.
- VIIRS is providing essential products for identifying the river plumes, which can be then targeted for sampling with gliders or other vessels.
- The AUV jubilee provided the opportunity to integrate outreach activities and teachers from all over the nation. Teachers were taught about gliders and how to integrate satellite data into their STEM curriculum development.
VIIRS Chlorophyll-a 7-days composite (July 13, 2015)
HYCOM Sea Surface Currents  SSS Contours

Texas A&M
Rutgers & USM
LI DAR flights
OSU
Skidaway
USF & MOTE
Warm core ring