

COASTAL –GILBES’ GROUP REPORT

(Performance period: March 1, 2010 to August 31, 2010)

RESEARCH COMPONENT

RESEARCH PROJECT SUMMARY FOR THE REPORTING PERIOD ONLY

Project	Tasks	CREST Researcher	Students involved	NOAA and Other Collaborators
Project (2) Field measurements in coastal waters for algorithm testing/development and satellite validation.	<p>Compare to satellite water leaving products and atmosphere retrievals.</p> <p>Inter-comparison of the below/above water signals with aircraft and satellite data as available.</p>	F. Gilbes	Natlee Hernández (M.S. Student)	<p>Joaquín Trinanes (Acting NOAA CoastWatch Operations Manager for the Caribbean Regional Node)</p> <p>From UPRM: Roy Armstrong</p>
Project (3) Improvement/ Development of algorithms for remote sensing of coastal waters.	<p>Analysis of optical field measurement together with Chl, TSS concentrations.</p> <p>Development of GIS database for land sea interactions in Mayaguez Bay.</p> <p>Development of GIS model for land-sea interactions in Mayaguez Bay.</p>	F. Gilbes	Natlee Hernández (M.S. Student)	<p>Joaquín Trinanes (Acting NOAA CoastWatch Operations Manager for the Caribbean Regional Node)</p> <p>From UPRM: Roy Armstrong</p>

Thrust: Remote Sensing of Coastal Waters

Project 2: Field measurements in coastal waters for algorithm testing/development and satellite validation

Project 3: Improvement/Development of algorithms for remote sensing of coastal waters

- **Relevance to NOAA’s mission and the strategic plan:** This project is well in view with NOAA’s vision and mission that establish a comprehensive understanding of the role of the oceans and coasts to meet our Nation’s economic, social, and environmental needs. It is aligned with the new priorities for the 21st century presented in the NOAA’s strategic plan and in regards of coastal and marine resources through an ecosystem approach to management. The research activities are helping to develop better and most cost-effective tools to monitor coastal processes.
- **Relevance to NOAA Line Office (i.e., National Weather Service, National Ocean Service) strategic plan:** This project provides critical support for NOAA’s missions of the National Ocean Service by using and validating environmental satellite data. Especially, it is creating an important database of bio-optical properties from coastal waters affected by rivers discharge. These field data are crucial to develop improved algorithms for the estimation of water quality parameters in coastal waters.
- **Supervising PI or Co-Is:** Fernando Gilbes Santaella
- **Publications (during performance period):**
 - Peer Reviewed Article:**
 - ❖ Vilmaliz Rodriguez is currently working in a paper of her second thesis chapter. It will be submitted to a scientific journal very soon.
 - Book:**
 - ❖ Work has continued for the peer-review book about the oceanography and remote sensing of Mayaguez Bay, including all the work sponsored by NOAA CREST. This book will be published in collaboration with the Center for Hemispherical Cooperation (CoHemis) of UPRM.
- **Dollar amount of funds leveraged with CREST funds (during performance period):**

Project Title	Sponsoring Agency	PI/Co-PI/ Recipient/Group	Dollars	Start Date	End Date
Developing a protocol to use remote sensing as a cost effective tool to monitor contamination of mangrove wetlands	University of Puerto Rico Sea Grant College	PI: Johannes Schelekens Co-PI: Fernando Gilbes	\$30,000 (No cost extension)	June 2006	December 2010

- **Ongoing, New or Revised?:** Ongoing
- **Staff:** None
- **Students PhD:** None
- **Students MS:** Natlee Hernandez, UPRM-Dep. Of Geology
- **Students Undergraduate:** None
- **NOAA Collaborators:** A site-specific algorithm has been developed and tested to estimate Total Suspended Sediments (TSS) in Mayaguez Bay. This algorithm is being incorporated in NOAA-NESDIS system as a “testing product” of TSS for Puerto Rico in collaboration with Joaquin Trinanes, Acting NOAA Coast Watch Operations Manager for the Caribbean Regional Node.
- **Other Collaborators:** Roy Armstrong (UPRM-Department of Marine Sciences).
- **Operational Impact:** The on-going project aims to develop the appropriate techniques to use ocean color sensors to monitor the conditions of coastal environments. Estimates of Chlorophyll and Suspended Sediments from space can be used as proxy for the quality of coastal waters. Continuous monitoring of such parameters with satellite sensors will help to better understand and manage our coastal environments.
- **Status of the project with respect to the goals/objectives and benchmarks previously identified:** Vimaliz Rodriguez successfully defended her thesis on December 8, 2009. This work was fully funded by NOAA-CREST and covered several tasks of this thrust. A site-specific algorithm for the estimation of Total Suspended Sediments in Puerto Rico coastal waters was developed and its implementation as “testing product of the NOAA CoastWatch program is underway. Remote sensing reflectance measurements obtained with the GER-1500 spectroradiometer were used to estimate this parameter and compared with MODIS data. Her work also helped to create the on-line GIS-database of the GERS Lab (GERSVIEW) and to evaluate a model for land-sea interface studies. A new effort by Natlee Hernandez is now in progress to better understand the effect of suspended sediments on the remote sensing reflectance. Good progress has been obtained in all proposed tasks.

Tasks (as per the Milestone Chart)

Task: Compare to satellite water leaving products and atmosphere retrievals

This task was mostly completed in Mayaguez Bay by Vimaliz Rodriguez during the last semester. In this reported period we developed the sampling protocols to measure total suspended sediments (TSS), backscattering (bb and bbp), and Remote Sensing Reflectance (Rrs) in the mouth of the rivers. This work will start this semester by Natlee Hernández. As part of this task we also started the processing of the optical data collected in La Parguera.

Task: Intercomparison of below/above water signals with aircraft and satellite data as available.

Development and validation of an algorithm to estimate total suspended sediment (TSS) was performed based on *in situ* remote sensing reflectance (Rrs) and MODIS/Terra band 1 data. Additional data and pre-processing parameters should be evaluated in order to improve validation results and produce TSS operational products for tropical coastal waters. The

processing in Mayaguez Bay has shown that improvements in the atmospheric correction are necessary. Natlee Hernández is now conducting several processing procedures in order to determine the best algorithms for the removal of the atmosphere in these coastal waters. This effort will allow obtaining better estimates of TSS.

Task: Analysis of optical field measurement together with Chl, TSS concentrations

A new effort has started in order to understand how the sediments of the Añasco, Yagüez and Guanajibo rivers affect the optical signal of Mayagüez Bay. This work is based on recent findings by Vilmaliz Rodriguez and is performed by Natlee Hernandez. Remotely sensed and *in-situ* measurements are going to be used. Determination Physical and geological characteristics of the suspended sediments will help us to understand the behavior of the spectral responses. The XRD and the Sedigraph 5100 instruments will be used to determine the mineral composition and the grain sizes. The MERIS ocean color sensor from the ESA (European Spatial Agency) data will be compared to in-situ measurements. Finally, all the data will be associated to the season in which was collected and correlated to the physical characteristics of the particles. During this semester field work and laboratory analyses will begin by Natlee.

Task: Development of GIS database for land sea interactions in Mayaguez Bay

Quality control of all data collected in Mayaguez Bay was continued during the reported period. In addition, new analyses of the collected optical data in La Parguera were started. These data set was not included during the first round of processing because the nature of processing and quality control is more complicated and requires particular attention. Transfer of knowledge between Vilmaliz Rodriguez and Natlee Hernandez continued in order to further develop the GERSVIEW database.

Task: Development of GIS model for land-sea interactions in Mayaguez Bay.

This task was completed by Vilmaliz Rodriguez last semester and it is described in her M.S. thesis. She used the Revised Universal Soil Loss Equation (RUSLE) in Mayagüez Bay watershed in a GIS based model.

Further details can be found in http://gers.uprm.edu/pdfs/thesis_vilmaliz.pdf.

Future Tasks (From the Milestones)

Efforts for developing site-specific algorithms for suspended sediments will continue. This will include a better understanding of the physical and geological characteristics of sediments. Optical data from La Parguera are being organized and will be added to the GIS databases. Very soon they will be exported to GERSVIEW on-line database (<http://gersview.uprm.edu>). This activity will allow people to access and manipulate the data via internet for better understanding of land-sea interactions in coastal waters of Puerto Rico. Natlee Hernández will continue working with this important aspect of the project. Another publication by Vilmaliz Rodriguez will be submitted to a peer-review journal very soon. The PI and other students will continue working with the chapters of the Mayaguez Bay book.