Progress Report

ADVANCING THE CARIBBEAN REGIONAL COASTAL OCEAN OBSERVING SYSTEM (CariCOOS)

1) Project Summary

CariCOOS has strived to meet prioritized stakeholder needs for coastal information with an efficient design minimizing observing assets while developing complementary modeling tools. This initial system has proved effective in providing wind, wave and current data products as well as simulations supporting forecasting these for the Atlantic and Caribbean insular shelves. A hurricane-driven storm surge modeling effort directed towards issuing inundation maps for the region is fully developed and operational dissemination of the remotely sensed water quality products provides valuable information to fishermen, managers and researchers. Through the present project we intend to complete and sustain the initial CariCOOS phase and develop the required observing, modeling and skill assessment assets and tools needed in support of shoreward extension of the CariCOOS product domains. Informational access to the nearcoastal regions will allow us to provide decision support to specific shore-dependent activities/sectors such as port and harbor operations, recreational activities and coastal resource management. Specifically we will focus on support to navigation safety and rapid response recovery in the most important regional ports, minimizing hazards to beachgoers and other recreational users, long term observing of climate change and ocean acidification, remediation, mitigation and adaptation to coastal hazards, data support for management of coastal resources including marine protected areas, and outreach and education to develop an "ocean literate" society. This project will continue support for the regional association in its mission including continued stakeholder engagement and representation and continuing CaRA's outreach and key alliances. We propose to undertake all steps necessary for certification of CaRA as a RICE as set forth in the Ocean Observing Act.

2) Progress and Accomplishments

Progress toward proposed *tasks* and *milestones* (in *italics*).

- *Subaward implementation and administration*

- The Subaward to the University of Maine (SA) for yr. 2 commenced in January 2013. A no cost extension to June 30, 2013 was requested and approved. Notwithstanding such administrative delays, U. of Maine's Physical Oceanography group, led by Dr. N. Pettigrew, have fully delivered all required services and products including data buoy data management, monitoring and yearly maintenance. Moreover they have assumed data collection, management and dissemination duties for a data buoy owned and deployed by the University of the Virgin Islands CMES at no additional cost to CariCOOS. Said data has been made available via CariCOOS dissemination systems.

- Delays in issuance of the UVI sub-award responded to changes in lead personnel at the University of the Virgin Islands. After an initial a draft Scope of Work (SOW) was found to be unviable, Director Morell travelled to St. Thomas to meet with the Vice-Provost of UVI, the Director of the Center for Marine and Environmental Studies (CMES), and Dr. Paul Jobsis, the newly appointed contact for CariCOOS and negotiate a viable plan. Following this visit UVI submitted a new draft that was found to be acceptable. Nevertheless, given the long delays it was decided that there would not be sufficient time for UVI to implement the work in the less than 2 months remaining and that mechanisms would be explored by which these funds would be rolled over for the remaining period of performance of the five year Cooperative Agreement.

- Although operation and maintenance of the WeatherFlow/CariCOOS mesonet has been satisfactory, sustained contractual issues regarding data availability to NDBC precluded timely formalization of the SA. After a delay pending negotiations between WeatherFlow and IOOS regarding mesonet, data dissemination via GTS and NDBC, CariCOOS has received a statement of work from WeatherFlow stating the following data restrictions:

  > "The data may be posted on the CariCOOS THREDDS server and may be passed to the WMO's GTS system through pathways that do not involve placing the data in the public domain. CariCOOS shall keep WeatherFlow informed of the methods used to pass the data to the WMO GTS."

  CariCOOS has repeatedly requested assistance from NOAA-NWS in clearing the data to GTS but such assistance has not been forthcoming.
  The above issues also precluded the installation of an additional mesonet station scheduled for this period. Nevertheless, the corresponding SA was issued in March, 2013.

- *Maintain existing data product availability and distribution*

  CariCOOS coastal buoy and wave buoy data and product dissemination has been successfully maintained; buoy data has been "pushed" to NDBC and made available to the community through CariCOOS data interfaces and web products. Mesonet data streams continue to be operationally distributed through MADIS, WeatherFlow and

CariCOOS data products and interfaces. Windnet data streams continue to be operationally distributed through MADIS and CariCOOS data products and interfaces. Real time data from CariCOOS buoys and Windnet station, delayed-time Mesonet data and model output from SWAN, Wave Watch III and NWS-Digital Forecast are available through the CariCOOS THREDDS server. Data and data products continue to be served through our CariCOOS web page (www.caricoos.org).

- ***Enhancement of DMAC subsystem***

  - CariCOOS THREDDS/OPeNDAP service fully operational; now includes improved configuration option, improved security and the following data streams:
    - CariCOOS Buoy data, updated twice daily
    - Mesonet station data are converted by CariCOOS into NetCDF files on a monthly basis, steps are being taken to provide preliminary data on a real-time basis;
      - Windnet data will be similarly available in late 2013;
    - SWAN model output grids available in NetCDF format;
    - ESA Ocean Color Chl a and Kd 490 Imagery;
    - NWS Operational Wind Forecast grids for the CariCOOS region;
    - Data from the NOAA MAP-CO2 buoy at La Parguera are being converted into NetCDF;
    - Cloud redundancy is being explored.

  - ERDDAP has been installed in our DMAC servers and is fully functional, however, additional configuration of our holdings and interface optimization are required before this service becomes an operational tool for our stakeholders.
  - Dual CariCOOS computational facilities at La Parguera, Lajas and UPRM Mayaguez now provide full site and hardware redundancy. Implemented hardening measures include installation of a unified threat management system.
  - Recently acquired duplicate DMAC THREDDS/OPeNDAP servers currently host our ERDDAP servers and will also host the SOS implementation being coordinated through IOOS headquarters.
  - Implementation plan for SOS services is already in place but the expected deployment date of May 2013 with support from national IOOS and a contracted developer has lapsed.
  - CariCOOS web data products now feed from a central MySQL database.
  - WMS-OGC compliance has been achieved through the acquisition and implementation of ESRI's ArcGIS Server for the distribution of water quality imagery and products and CariCOOS storm surge maps for Puerto Rico and the USVI. This service is operating as an experimental interface.

- ***Provide yearly maintenance to the existing CariCOOS coastal buoy array***

  The 3 CariCOOS GOMOOS type data buoys went through the yearly overhaul in May 2013. The PR Ports Authority, the Port of Ponce and the West Indian Company provided dock space for buoy maintenance free of charge.
  The CariCOOS wave buoy at Rincon, P.R. was accidentally set adrift by an unknown source. Prompt notification from CDIP personnel in San Diego allowed rapid recovery of

the buoy. Following refurbishing of the mooring the buoy was set to work with little time lost. Yearly maintenance is scheduled for the month of June.

The MAPCO2 buoy operated jointly by NOAA PMEL and CariCOOS was removed from the water and thoroughly refurbished in early December 2012. All instruments were swapped out and replaced with re-calibrated instruments measuring air and water xCO2, pH, temperature, salinity and dissolved oxygen. A malfunctioning SAMI pH unit was removed and replaced with an instrument provided by PMEL in April 2013.

- **Deployment and operation of an additional CariCOOS coastal data buoy in Vieques Sound.**

Following formal stakeholder site consultations for deployment of this CariCOOS data buoy in support of ferry and recreational operations in the Vieques Sound and Culebra region, a site vetted by local USCG officials was chosen and a request for a Nationwide Permit was submitted to the local USACE offices in February 2013.

The Nationwide permit was granted on May 31 2013 and an application for a permit for Private Aids to Navigation (PATON) was submitted on June 5 to the Seventh Coast Guard District in Miami, FL.

A call for quotes for the buoy deployment operation is currently being drafted. We anticipate deployment in July depending on the expediency of the USCG permitting process.

- **Operate and maintain 12 coastal weather MESONET stations and add 1 station**

  - CariCOOS/WeatherFlow MESONET:

This network continues uninterrupted operation at seven of the twelve stations. During the reporting period, maintenance was performed as follows:

  - On December 12, 2012 WeatherFlow performed maintenance at the Buck Island, USVI station after the entire station came down on November 28, 2012.
  - On April 5, 2013 WeatherFlow performed maintenance at the St. Croix, USVI Sandy Beach station where the wind anemometer was not reporting the wind direction since December 12, 2012
  - During the week of May 13-17, 2013 WeatherFlow performed maintenance works on the following stations:
    - Aguadilla Jetty, PR on May 13, 2013 the air temperature sensor was fixed after the station stopped reporting air temperature January 6, 2012.
    - San Juan NAVAID, PR - on May 14, 2013 the wind anemometer was fixed after the station stopped reporting wind speed March 20, 2013
    - Two Brothers, USVI - on May 16, 2013 the station was brought back on line. It was down due to batteries problems since August 4, 2012

  - CariCOOS Windnet (1 Station): The CariCOOS Windnet station located in Rincon, PR continues interrupted operation.

- **Validate SWAN (wave), ADCIRC (coastal inundation) and WRF (wind) forecasting skills**

Further to actions described in our previous report, we undertook the task of evaluating the performance of the regional HYCOM-ROMS general circulation model (GCM), implemented in collaboration with L. Cherubin at U of Miami, RSMAS, and the AMSEAS NCOM model (provided by NAVO, US NAVY at 3 km resolution).

Inspection of the **HYCOM-ROMS** output consistently showed meso and regional scale circulation features not consistent with well documented regional processes therefore prompting postponement of a formal validation effort until the gross malfunction is corrected. Recently, poor performance was traced to the use of erroneous climate forcing data. Correction of this issue is currently underway.

Validation of **AMSEAS NCOM** output has shown adequate resolution of major near-surface circulation features in the region and agreement with CariCOOS buoy observations. Instrumental deployments for regional scale skill assessments have been scheduled for fall.

CariCOOS continues to provide backup mirror run of the NWS San Juan local office 6km and 2km operational **WRF** model. Runs of 72 hrs. forecast four times a day at 00Z, 06Z, 12Z and 18Z set up, are available at:
>	http://www.caricoos.org/drupal/wrf_6km
>	http://www.caricoos.org/drupal/wrf_2km

An experimental high resolution 1km **WRF** model setup is currently under evaluation since December 12, 2012. The experimental model configuration provides 48 hrs forecasts daily at 00Z, available at:
>	http://136.145.249.39/drupal/node/71
>	http://136.145.249.39/drupal/wrf_sju

Progress towards Hurricane-driven Coastal Inundation maps for the US Virgin Islands:

- Following numerous data and code fixes, all storm surge runs for the US Virgin Islands have been finalized. These include three hurricane headings (towards 60°, 270°, and 290°), and categories 1, 2, 3, 4, and 5. Delays experienced were due to the following circumstances:
  - The most recent National Geophysical Data Center DEM for the USVI was found to be unusable for storm surge flood mapping so a LIDAR topography data set made for FEMA Flood Insurance Studies by the US Army Corps of Engineers in 2007 was used to replace it. This replacement meant repeating all previous computer runs.
  - After having almost finished the new computer runs a bug was found in the coupled version of ADCIRC+SWAN entailing erroneous of use wind drag coefficients that resulted in obviously erroneous significant wave heights of approximately 25 m. After this was fixed the runs were reinitiated.

- With these results in hand, we have now begun the preparation of shape files and kmz files for:

- Maximum Envelope of Highest Water (MEOHW) for each individual hurricane simulation.
- Maximum of the Maximums (MOM) for each group of the three storm headings. In this step the MEOHW's of all runs for a given heading are collected and the maximum of the maximums at each computational cell is determined. The end result is the maximum inundation for that group of storm headings.
- The MOM of the MOM's, in which the maximum flooding is shown irrespective of the storm heading.

All of the shape files and kmz files should be ready by the end of the month of June, 2013. A final report is being written.

- **Implement inshore high resolution SWAN and ROMS for San Juan & Charlotte Amalie**

High-resolution forecast implementations of the SWAN wave model for the San Juan and USVI domains continue to be served routinely through our servers at http://www.caricoos.org/drupal/swan_multigrid.
Harbor circulation models for San Juan and Charlotte Amalie continue in development under Dr. Stefano Leonardi's leadership. Boundary conditions provided by NAVO NCOM AMSEAS have proven adequate for the task. Models for Charlotte Amalie now resolve the strong currents reported by Port Captains at West Gregery Channel. Field validation of model output awaits final operational model implementation.

- **Issue a pilot web interface product in support of SJ-Harbor operations depicting high-res wave, wind and current forecasts, now-cast and real time data**

The San Juan Harbor SWAN wave model is now operational and can be viewed at: http://www.caricoos.org/drupal/swan_multigrid/SJBAYHIRES. ROMS model implementation continues under development.

- **Initiate development of Beach Hazard Forecast System**

Our objective is to publish a custom website dedicated to providing real-time and forecast information on the likelihood and potential danger of wave-induced currents at all of the major recreational beaches in Puerto Rico. We have begun work on the beach hazard warning system using wave input data from several sources including the NWS marine forecasts, CariCOOS buoy data as well as data from the CariCOOS Nearshore Wave Model. The beach hazard algorithm which is in development takes into account all of this data as well as local bathymetry, empirical and anecdotal knowledge to emit a "surf zone hazard level" for each beach. A total of 44 beaches have been selected based on the official list of beaches provided by the Department of Natural Resources Office of the Commissioner of Navigation. A CariCOOS intern (Estefanía Quiñones) is working over the summer in the development of the warning system.

- **Implement water quality measurements including pH and optical properties and development of remote sensed water quality products**

In situ optical properties and remote sensed water quality products: In situ sample and optical data collection continues at five stations off the coast of southwest Puerto Rico (Guánica-La Parguera, P.R.). Data from this effort supports the development of a regional algorithm for the estimation of sediment loading in coastal waters using remotely sensed ocean color imagery.

215 images at 300m resolution collected from 2005 to 2009 by the Medium Resolution Imaging Spectrometer (MERIS) and provided by the ESA sponsored CoastColour program were processed using the Case-2 Regional Processor (MERIS) tool in VISAT 4.10.3. Derived products applicable to documentation of spatial and temporal changes in coastal water quality includes water leaving radiance reflectance, Total Suspended Matter (TSM), Chl a and Kd_490. Daily imagery products as well as yearly means and maximums for Chl a and TSM are available via a GIS interface also including pertinent layers such as benthic community maps (NOAA), watershed properties (USGS) and land use (USDA).

Near real time (NRT) ocean color MODIS Aqua imagery products (Kd 490 and Chl a) at 1km resolution, issued by ESA GlobColour, continues to be posted at CariCOOS.org. Analogous products from MODIS Terra and VIIRS, issued by NASA will be incorporated to the NRT imagery suite available to CariCOOS stakeholders.

Ocean Acidification: Autonomous MapCO2 and discreet "In situ" sampling program has continued as programmed. These former observations are validated and the data are routinely merged with oceanographic and meteorological data available from the nearby ICON/CREWS station. See prior report for details.
An article describing a new method for rapid, precise analysis of calcium and magnesium ions in seawater has been accepted for publication in Limnology and Oceanography Methods. The article, a part of graduate student Melissa Meléndez's Master's thesis, was made possible through multiple collaborations. The PR Sea Grant Program, the UPRM Department of Marine Sciences and CariCOOS helped finance Ms. Meléndez's travel to Australia where she was received as Honorary Research Assistant at the Australian Center for Research on Separation Science (ACROSS) of the University of Tasmania last year.

- ***Implement offshore sampling and CaTS occupations***

Offshore sampling at the CaTS serial oceanographic station to the south of PR, the Caribbean Time Series Station-CaTS has been hampered by weather limitations and equipment malfunction. Sampling equipment is currently being repaired at Sea-Bird Electronics. Offshore surface sampling continues at a station accessible by small boat one mile off the shelf edge at La Parguera.

- ***CariCOOS O&E program***

Teacher training activities

- **Ana G Mendez University (UMET)** Environmental School and the Puerto Rico Education Council. Workshop by Yasmin Detres: "Puerto Rico Coastal Weather" for the Terrestrial Science Program Teachers certification program.
- The **CariCOOS – USCG Auxiliary Teamwork: Improving Boaters Safety & Coastal Weather Literacy**. Partnership with the Cabo Rojo Flotilla of the USCG Auxiliary. Since June 2012, Instructors from the Flotilla participated of interactive workshops where CariCOOS experts provided the skills and capabilities to teach about real time and forecast products for coastal weather. Development of an experimental coastal weather boater's guide to supplement the Boating Skills and Seamanship course in support of recreational boating safety. Boaters guide was also presented to the South Coast Harbor Safety & Security Committee.

Educational materials:

- **CariCOOS Educational Booth** A custom booth was purchased and outfitted for CariCOOS outreach at public events. The booth was first used during the CariCOOS General Assembly in March.
- **The Coastal Climates of our Islands** educational module integrating coastal weather concepts and its impacts on the US Caribbean coasts was translated to English. Free copies of DVD's or hard copies are being distributed in educational activities and are available by request at caricoos@gmail.com or by download from CariCOOS.org.
- **Puerto Rico's Coastal Weather: Boater's Guide**, a straightforward set of guidelines developed by CariCOOS to supplement the USCG Auxiliary Boating Skills and Seamanship Marine Weather section in support of recreational boating safety.
- **CariCOOS videos**- two videos were developed and uploaded at You Tube:
    - Introduction to CariCOOS
    - CariCOOS tutorial
- **Scale model buoy** – design and construction of a scale model of CariCOOS buoy to be used as an educational resource. The model integrates all the components of a real size buoy to illustrate about technological aspects including real time measurement capabilities.

Student training:

Undergraduates: CariCOOS Summer Internship: Estefanía Quiñones (UPR Mayaguez -Physics), Edward Rivera (UPR Mayaguez - Mechanical Engineering) and Luis Pomales (UPR Humacao, Applied Physics) were selected for participation in the first CariCOOS Summer Internship Program for undergrads. These students will work under the supervision of CariCOOS researchers in projects related to the CariCOOS mission. Internship dates are June 3 to July 26, 2013.

Exhibits/outreach activities:

- o 8th International Multi-Purpose Reef & Surfing Science: Symposium (February 19-21, 2013), Rincon, PR.
- o Geological Society of America 62nd Meeting of the Southeastern Section (March 20-21, 2013), Caribe Hilton, San Juan PR.
- o Marine Sciences Week **(**April 30 – May 9, 2013), UPRM General Library.
- o "Operadores turísticos del este" workshop (May 6 – 7, 2013), Fajardo, PR.
- o "Feria Turismo y Recreación" (May 27, – June 2, 2013), Plaza Las Américas shopping Center, San Juan, PR. This is a major activity promoting nautical recreation in Puerto Rico. CariCOOS presence was maintained throughout the event.
- o CaRA/CariCOOS news items are regularly posted at: http://cara.uprm.edu/?q=node/45.
- o Three editions of CaRA-VI Update were published and distributed.
- o The CariCOOS banner continues to be posted in seasonal issues of PR's nautical newspaper "La Regata".

- **Continued web page development and optimization.**

  Several steps have been taken towards web page optimization and development:

  - o Following deprecation of Google Maps Version 2 we have successfully migrated to version 3.
  - o The data stream from the UVI EPSCOR buoy has been incorporated in the CariCOOS map and in the top navigation buttons.
  - o Settings changes to improve page speed have been implemented following webhost company GoDaddy recommendations.
  - o Settings in Drupal were also changed for this purpose.
  - o A new "wind assessment tool" similar to our "model assessment tool" is being developed to allow comparison of the WRF 1 Km wind model with the NWS model.

Collaborative efforts

High Frequency Radar operation: CariCOOS continues its successful collaboration with the Center for Secure and Resilient Maritime Commerce (CSR) a DHS Center of Excellence headquartered at Stevens Institute of Technology, Hoboken, NJ. Together with scientists from Rutgers University's Coastal Ocean Observing Laboratory (RU COOL), a CSR member, CariCOOS operates a pair of HF radar installations on the west coast of Puerto Rico that provide multiple use capabilities for surface ocean current monitoring, vessel detection and tracking, and virtual particle tracking.

CariCOOS provided assistance in celebration of CSR's yearly Investigators Meeting and helped identify participants in a related Stakeholders Engagement Meeting, both held in San Juan PR in January 2013.

HF Radar Software Workshop: A hands-on informal course on processing and visualization of CODAR ® HFR data was held at the Field Station of the University of Puerto Rico's Department of Marine Sciences in La Parguera, Puerto Rico May 29-31. Dr.

Hugh Roarty of Rutgers University's Coastal Ocean Observing Laboratory, a recognized authority on HFR operation, travelled to Puerto Rico to serve as course instructor. Eleven students, professors and technicians associated with the UPRM CSR group, CariCOOS and the Puerto Rico Seismic Network participated in the 3-day course gaining proficiency in system operation, generation of radial and total files, surface current field visualization and virtual particle trajectory generation. In addition to CSR and CariCOOS support, this joint initiative received support from MARACOOS, the Mid-Atlantic Regional Association Coastal Ocean Observing System. The UPRM NOAA Center for Atmospheric Science (NCAS) hosted the activity at the Bio-optical Oceanography Laboratory computer center.

Puerto Rico Beach and Surf zone Currents Warning System:
The UPR Sea Grant program has provided financial support to CariCOOS Associate Director M. Canals for the development of the Puerto Rico beach and surf zone currents warning system. Sea Grant funds were targeted to the development through numerical modeling and in situ validation and deployment of current warning signs depicting the particular hazardous conditions of each of the island's deadliest beaches. This program is cosponsored by CariCOOS and its deployment scheduled for the upcoming program year.

3) Scope of Work

Major Milestones for upcoming year include completion of tasks included in the initial Scope of Work statement:
- Continued operation and maintenance of CariCOOS buoy array.
- Continued operation and upgrade of data and product dissemination program.
- Continued development of CariCOOS DMAC system including ERDAPP and SOS services.
- Continued operational deployment of CariCOOS SWAN MultiGrid.
- Skill assessment and operational implementation of CariCOOS ROMS/AMSEAS circulation model for San Juan and Charlotte Amalie harbors and approaches.
- Issue a pilot web interface product in support of SJ-Harbor operations depicting high-res wave, wind and current forecasts, now-cast and real time data.
- Operational deployment of Beach Hazard Forecast System.
- Regional validation of CariCOOS HYCOM-ROMS and AMSEAS GCM forecasts.
- Deployment of CariCOOS data buoy E off the East coast of PR.
- Assist in operation / data management of UVI/CMES data buoy.
- Preparation of storm surge flood maps for Puerto Rico for categories 1-5 hurricanes.
- Continuation of O&E program including teacher and intern training, issuance and dissemination of educational material and coordination of outreach activities.
- Upgrading HF Radar network by replacement with one new CODAR system.
- Continuation of water quality product development and Ocean Acidification monitoring program.
- Implementation & validation of high-resolution WRF for critical domains in support of marine weather forecasting, harbor operations and beach hazard products.

- o Improvement of wind measuring subsystems (Windnet/WFlow/PR Seismic network station) following a revised need analysis and identification of DMAC-consistent data dissemination scheme.
- o Provide support to the Caribbean Regional Association for Ocean Observing's mission including continued revision of CaRA/CariCOOS organizational structure and affiliation and meeting IOOS certification criteria.

4) Leadership Personnel and Organizational Structure

Dr. Kostas Alexandridis, Assistant Professor at the Marine and Environmental Sciences Dept. UVI who served briefly as CariCOOS liaison has now been replaced by Prof. Paul Jobsis.

Upon an expression of concern by the Director regarding the need to explore alternate organizational structures that would allow optimal reception and use of funds as well as provide for meeting IOOS certification criteria, CaRA's council endorsed the initiative and recommended procuring the necessary expertise. CariCOOS leadership met with Pedro Hernandez, from the Marichal, Hernandez, Santiago & Juarbe LLC law firm, discussed CaRA's and CariCOOS particular needs and required a proposal for their advisory services.

5) Budget Analysis:

Expenditures for most budgetary lines have progressed as originally proposed. Under expenditures for the contractual line, detailed in the subaward tracking summary table below, responds to issues with subawards. Briefly, the major issues met are 1) UVI was unable to identify a PI to lead their collaborative effort 2) Due to administrative delays U. Maine has not issued a final invoice 3) Disagreement on limitation of data distribution to NDBC resulted in postponement a stations deployment. These issues are discussed in detail in the Subaward Implementation and Administration section of this report.

CariCOOS SUBAWARD TRACKING SUMMARY						
	BUDGET	INVOICED	REMAINING	% REMAINING	% INVOICED	SOW % COMPLETE
Subawardees:						
SA_University of Maine*	$216,055	$0	$216,055	100%	0%	100%
SA_U. Virgin Islands	$0	$0	$0	0%		0%
SA_WeatherFlow, Inc. **	$29,767	$18,540	$11,227	38%	62%	62%
SA_University of Miami**	$41,593	$39,478	$2,115	5%	95%	100%
Subawardee Total	$287,415	$58,018	$229,397	80%	20%	
*pending invoicing by U Maine						
**pending processing by UPRM R&D Center						

Monitoring of UPRM's financial records to March 31, 2013 reported these to be in agreement with CariCOOS "shadow" accounting records. An updated report will be issued at the end of June 2013 and submitted to UPRM's R&D Center.

6) Issues
No major issues to report other that those detailed under budget analysis (see above)