NOAA IOOS Program Office
Regional Status Assessment for
Caribbean Regional Association

April 23-24, 2008

Julio Morell/ Jorge Corredor/Roy Watlington

RA Structure and Governance

- RA leadership
  - Julio M Morell, Executive Director & PI
  - Jorge E Corredor, Stakeholder Council Chairman & Co- Investigator
  - Roy Watlington, CaRA US Virgin Islands Coordinator & Co-Investigator

- Organizational structure
  - Memorandum Of Agreement

    (signed on Dec 4, 2007)

RA Structure and Governance

- Membership:
  - 57 signatories
- Affiliations
  - Academics 18%
  - Government agencies 12%
  - Private Sector 40%
  - Federal Agencies 9%
  - Self Signatories 21%

RA Structure and Governance

Stakeholders Council

- 12 Council Members
  - 1 Council Chairman
  - 1 Council Secretary
  - Executive Committee (4 council members)
  - Membership and Nominations Committee
  - 4 additional committees to be empanelled:
    - » Education & outreach
    - » DMAC
    - » Observing systems
    - » Products and Services

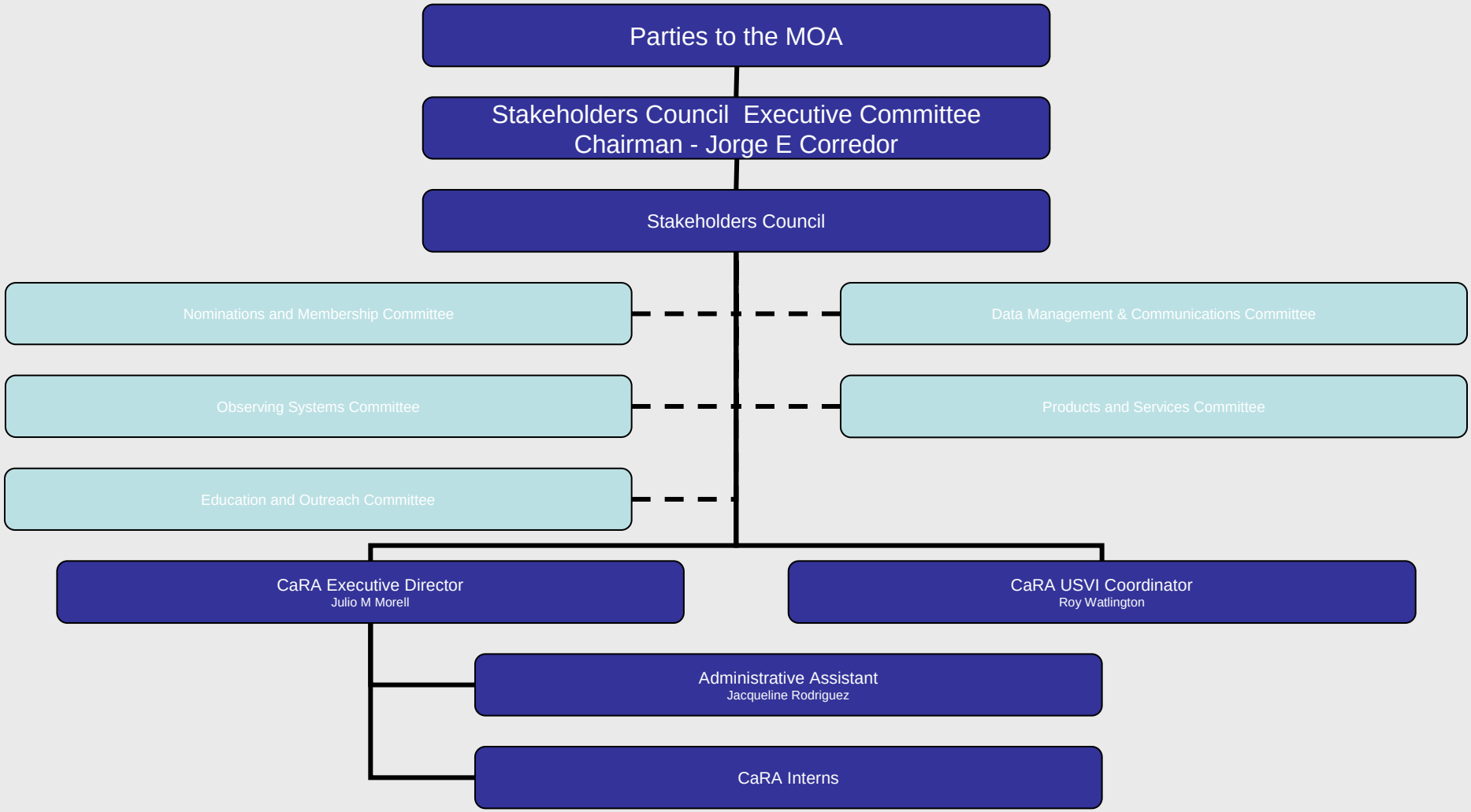
Stakeholders Council Members:

- Jorge E. Corredor, (Council Chaiman) – Professor UPRM
- Graciela Garcia (Council Secretary) - Caribbean Fisheries Management Council (CFMC)
- Luis M. Amador – President, Parguera Fishing Charters
- Ruperto Chaparro – Director, Puerto Rico Sea Grant Program
- Ileanna Colón-Carlo - Private citizen representing the marine recreational community
- Ada Monzón – Chief Meteorologist Univision de Puerto Rico
- Eugenio Piñeiro – Commercial fishermanm & Chairman CFMC
- Eladio Rodríguez – Vice-President McAllister Towing & Transportation Co.
- Mark Sabino – Dockmaster West Indian Company Ltd
- Marjorie Smith – President, Smith's Ferries
- Javier Vélez-Arocho – Secretary, PR Department of Natural & Environmental Resources
- Christa von Hillebrandt – Director, PR Seismic Network

Meetings (frequency, focus)

- The Stakeholders Council meets at least once per year or special meetings per request
- The council provides policy guidance, ensure sustained support by the Parties, and approve implementing documents, including fiscal plans
- Decisions are by consensus or majority vote
- Quorum consists of half plus one

RA Structure and Governance
CaRA Organizational Chart



RA Structure and Governance (Continued)

- Until such time as this agreement is modified, CaRA will not have fiduciary authority. Accordingly, CaRA will utilize existing institutional structures having such authority (termed herein the “Fiscal Agents”), such as the University of Puerto Rico, Mayagüez Campus, and the University of the Virgin Islands, through which CaRA will apply for grants and implement grant proposals. These Fiscal Agents may also accept any other funds from CaRA parties or any other interested private or public entity or individuals. The Fiscal Agent(s) shall, with the CaRA Treasurer, account for money due and payable to CaRA, and in general perform or cause to be performed all duties incident to a financial agent.
- Through the Fiscal Agent(s), CaRA will receive and distribute CarICOOS-related funding and other resources from federal, state, other public agencies, foundation sources, corporations, and private donors, according to the CaRA identified priorities.

User group representation

- Academic
- State Government (eg DRNA)
- Federal sector (eg Caribbean Fisheries Management Council)
- Communications Area (TV media, Newspapers)
- Tourism
- Tour and Boat Charters
- Marine Transportation (Cruise ship docking, Interisland ferries, Barge Towing)
- Commercial Fishermen
- Private citizens

Institutional Parties to CaRA MOA

- University Puerto Rico at Mayaguez , represented by the Chancellor Jorge Iván Vélez-Arocho
- University of the Virgin Islands , represented by the President LaVerne E. Ragster
- Government of the USVI, represented by the Hon. Barbara Petersen
- Puerto Rico Department of Natural Resources and Environment represented by the Hon. Javier Vélez-Arocho
- **Institution/Organization**
- Jobos Bay National Estuarine Research Reserve DNER-NOAA, represented by Angel Dieppa
- PR Department of Natural Resources and the Environment, represented by Ernesto Díaz- Velásquez
- La Regata, Puerto Rico's Boating Newspaper, represented by Benito Pinto-Rodríguez
- PR. Sport Fisherman's Association, represented by Angel M. Canabal
- Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science, represented by Fernándo Gilbes
- Environmental Quality Board, represented by Carlos W. Lopez
- Ocean Geeks LLC, represented by Melbourne Briscoe
- Vicente & Associates Inc., represented by Vance P. Vicente
- Puerto Rico Seismic Network, represented by Christa von Hillebrandt
- Interdisciplinary Center for Coastal Studies, represented by Carlos J. Carrero-Morales
- The Dive Shop-Mayaguez, represented by Edwin Vélez
- Coastal Hazard Center , represented by Aurelio Mercado
- Puerto Rico Sea Grant College Program, represented by Ruperto Chaparro
- Caribbean Fishery Management Council, represented by Eugenio Piñeiro-Soler and Graciela García-Moliner
- Marina Costa Azul, represented by Alberto Arroyo Irizarry and Noraida Padovani
- San Juan Bay Estuary Partnership, represented by Jorge Bauzá
- The West Indian Company Limited St. Thomas, represented by Mark Sabino
- U.S. Virgin Islands Department of Tourism, represented by Brad Nugent
- U.S Virgin Islands Department of Planning and Natural Resources, represented by Alicia Barnes
- Smith's Ferry Services, LTD, represented by Marjorie E. Smith
- Caribe Aquatic Adventure, represented by Demetrio A. Vega
- Ventolera Hi-Wind Center & Surf Shop Corporation, represented by Eddy Rodríguez-Ramos
- Paradise Scuba & Snorkely Center , represented by Orlando Espinosa
- Soler Travel Agency, represented by Ivan Soler
- Bluewater Management, represented by Emilio I. Soler-Santos
- USCG Auxiliary Flot-1-12, represented by Alma I. Solá-Rivera
- USCG Auxiliary Flot-1-8, represented by Andrés Acosta
- Cooperativa de Ecoturismo y Recreación del Oeste, Inc., represented by Luis Vivaldi-Olivar
- Puerto Rico Hotel & Tourism Association, represented by Ada Torres-Ramírez
- Island Venture Water Excursions Inc, represented by Rafael Vega and Radamés Rosado
- National Response Corporation, represented by David Avilés
- Rutgers University Coastal Ocean Observation Lab., represented by Scott Glenn
- Bio-optical Oceanography Laboratory at UPRM, represented by Roy A. Armstrong
- Parguera Fishing Charters, represented by Mickey Amador
- P.R. Highway and Transportation Authority of the P.R. Department of Transportation and Public Works, represented by Irma M. García-González
- NOAA Center for Atmospheric Sciences (NCAS) at UPRM, represented by Yasmin Detrés
- NOAA-National Weather Service at San Juan , represented by Scott Stripling
- Scuba Dogs Society, represented by Alberto Marti
- Surfrider Foundation, represented by Leon Richter
- Efrain Visuals represented by Efrain Figueroa
- Discovery Bay Resort & Marina, represented by Tommy Cordero

- Types and frequency of engagement (workshops, regular meetings, etc.)
  - A General Assembly is celebrated once a year (usually in December)
  - CaRA periodically convenes informative meetings for particular stakeholder sectors (see below Milestones & Status)

Key issues of importance to regional stakeholders:

- Prioritary stakeholder needs identified through CaRA activities are real time data, products and forecasts for:

  coastal weather, coastal waves, coastal currents, storm surge driven coastal inundation and water quality.

- CaRA has proposed for CarICOOS Implementation :
  - 2 Instrumented buoy emplacements (Atlantic & Caribbean)
  - Network of hurricane-hardened coastal meteo systems (in collaboration with WeatherFlow Inc)
  - A concerted numerical modeling effort (that will assimilate the data generated above) for regionwide nowcasting using:
    - Regional currents – NCOM & HYCOM/ROMS
    - Coastal tidal currents – ADCIRC
    - Coastal & nearshore waves – SWAN
    - Coastal winds – CaRA WRF & WeatherFlow RAMS

Current Activities and Funding - Key IOOS activities

- Sources of funding
  - NOAA IOOS and other NOAA funds
    - Ongoing:
      - RA Planning Grant (FY2005-2007)
    - Recommended for funding:
      - RA Support Grant (FY2008-2010)
      - CarICOOS Implementation (FY2008-2010)

Other Funding

- CaRA has identified a strong need for numerical modeling capacity in the region. For this purpose (and as a contribution to CaRA), the UPRM Chancellor Dr. Jorge Ivan Velez-Arocho has funded the *CaRA-UPRM Alliance for Numerical Coastal Modeling*

- PR - DNRE has commissioned a ANCM study to delineate the coastal zone in terms of storm surge lines based on CaRA's ADCIRC implementation.

- UPRM Dept of Marine Sciences hosts CaRA offices and has provided funding for office remodeling

- UVI hosts CaRA-VI offices

- Other Partner funding
  - PR Seismic Network (sea level gauges & coastal meteo stations)
  - UPRM-NOAA PR Coastal Hazards Center (tsunami inundation modeling)

Cara/Alliance expert system design and modeling visits:

- David Hill - Pennsylvania State University - to develop the Coastal circulation and tide modeling with the ADCIRC modeling system. (David Hill implemented ADCIRC in Glacier Bay, Alaska).
- Brian O Blanton - Renaissance Institute - to develop storm surge modeling with the ADCIRC modeling system. (Blanton is part of the modeling group that conducted flood insurance studies for Louisiana, using ADCIRC.)
- Laurent Cherubin - University of Miami, RSMAS - to develop general circulation modeling in the PR-USVI region using HyCOM and ROMS. (Cherubin is part of the UVI EPSCOR ocean modeling group. He implemented a model sub grid for the west coast of Puerto Rico).
- Neal Pettigrew - University of Maine Physical Oceanography - to develop the design and construction of coastal observing buoy systems. Pettigrew is Chief Scientist of GoMOOS and owner of Ocean Science and Technology, LLC.
- Joaquín Triñanes - NOAA CoastWatch, Caribbean & Gulf of Mexico Node - to develop remote sensing products for water quality (coastal management) determinations and tropical coastal ecosystem research.
- Patrick Lynett – Texas A & M – to develop local implementation of the COULWAVE model for coastal hazards modeling.
- Scott Glenn, Bob Chant, David Chapman – Rutgers U. COOL lab and SECOORA – for Webb Technologies SLOCUM Glider Demonstration Project
- Juan Carlos Ortiz – U del Atlantico, Colombia – to develop local implementation of the SWAN wave model
- Joe Salisbury – University of New Hampshire – for Mayaguez Bay circulation model
- Melbourne Briscoe – Invited speaker for General Assembly
- Bror Johnson – Boston University – for Mayaguez Bay circulation model

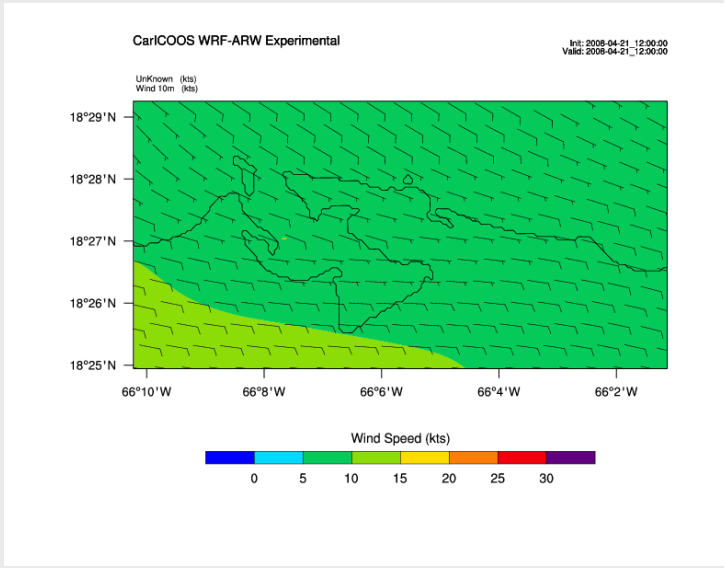
- Visits Programmed

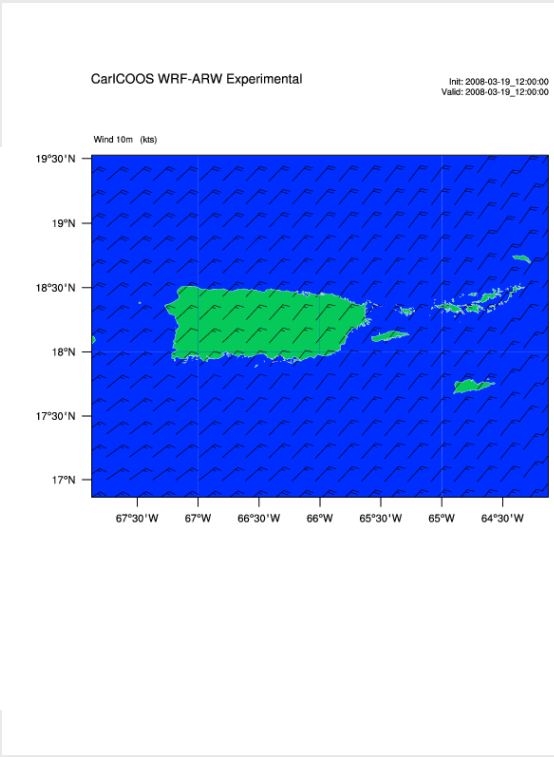
- Dong-Chan Ko – NRL for NCOM model data access
- Ian Sears – NOAA NDBC – Buoy consultations

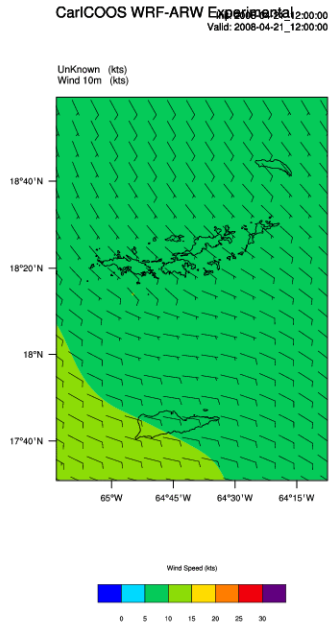
Current Activities:

CarICOOS WRF Coastal Wind modeling initiative

Scott Stripling, NWS meteorologist and CaRA intern Juan Gonzalez are developing the WRF wind product.





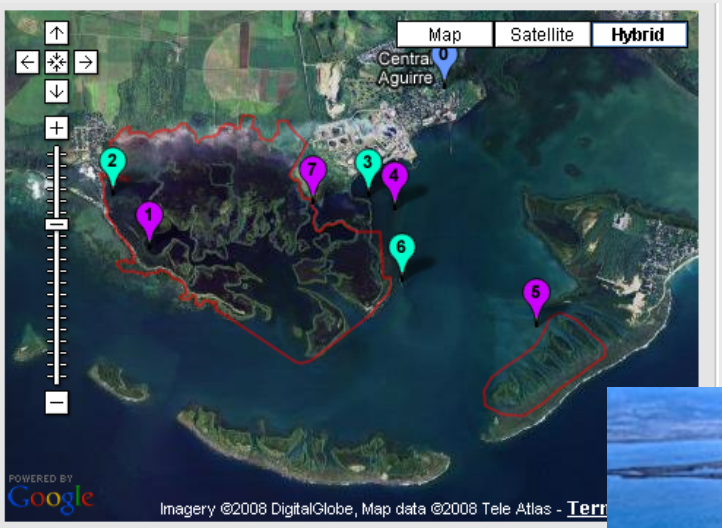


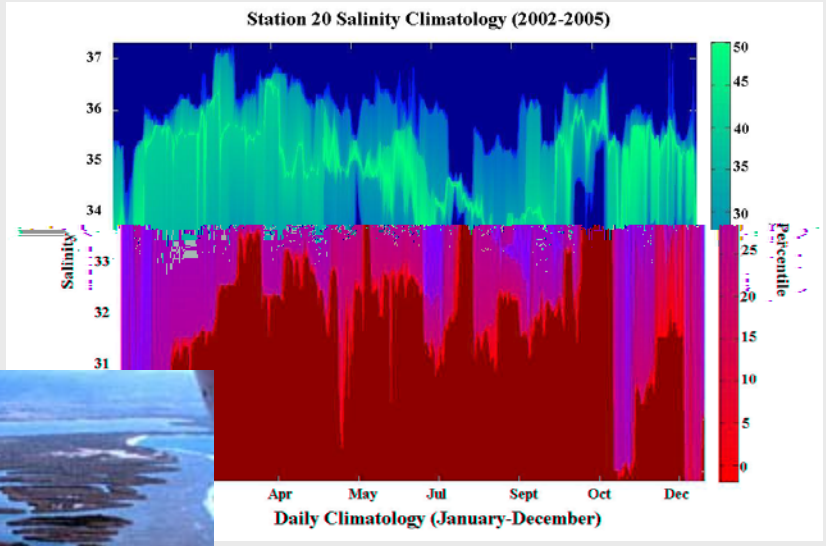
Current Activities:

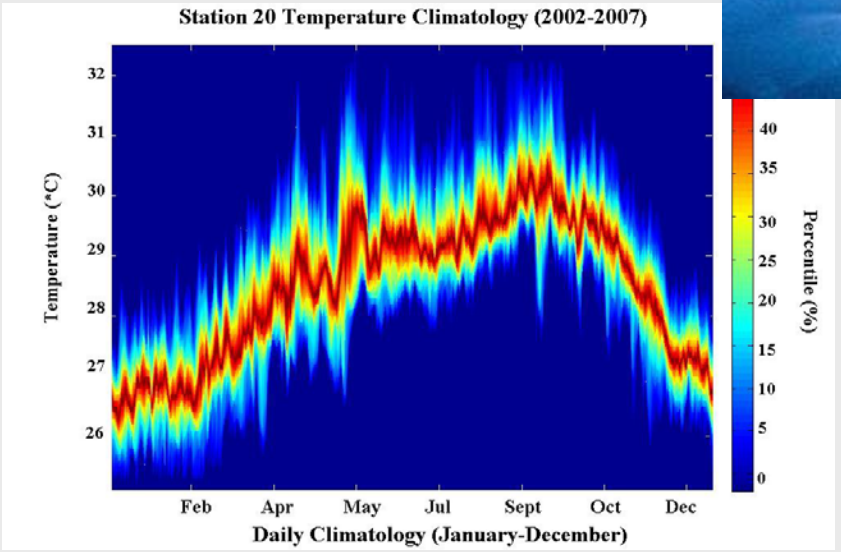
CarICOOS Jobos Bay Climatology Initiative

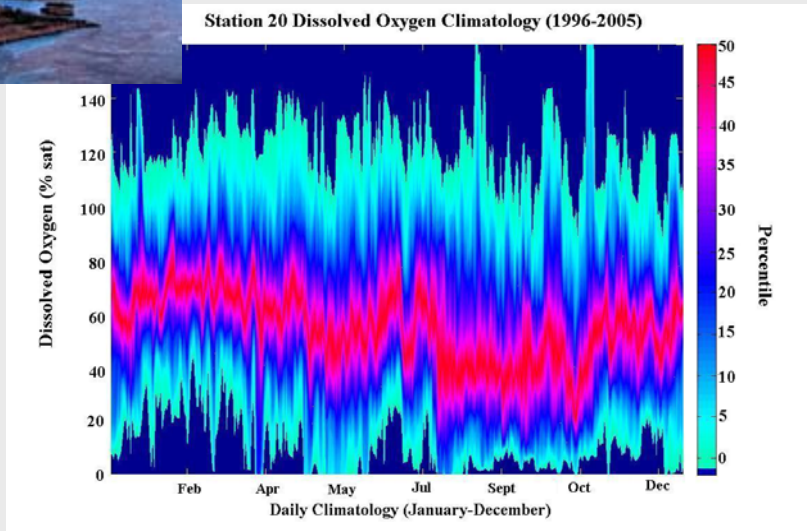
CaRA interns André Amador and Carlos Anselmi are developing climatologies for data products from the Jobos Bay National Estuarine Research Reserve instrument network.

Dr. Ru Morrison of University of New Hampshire has generously provided CaRA with MatLab code he has developed for climatological products

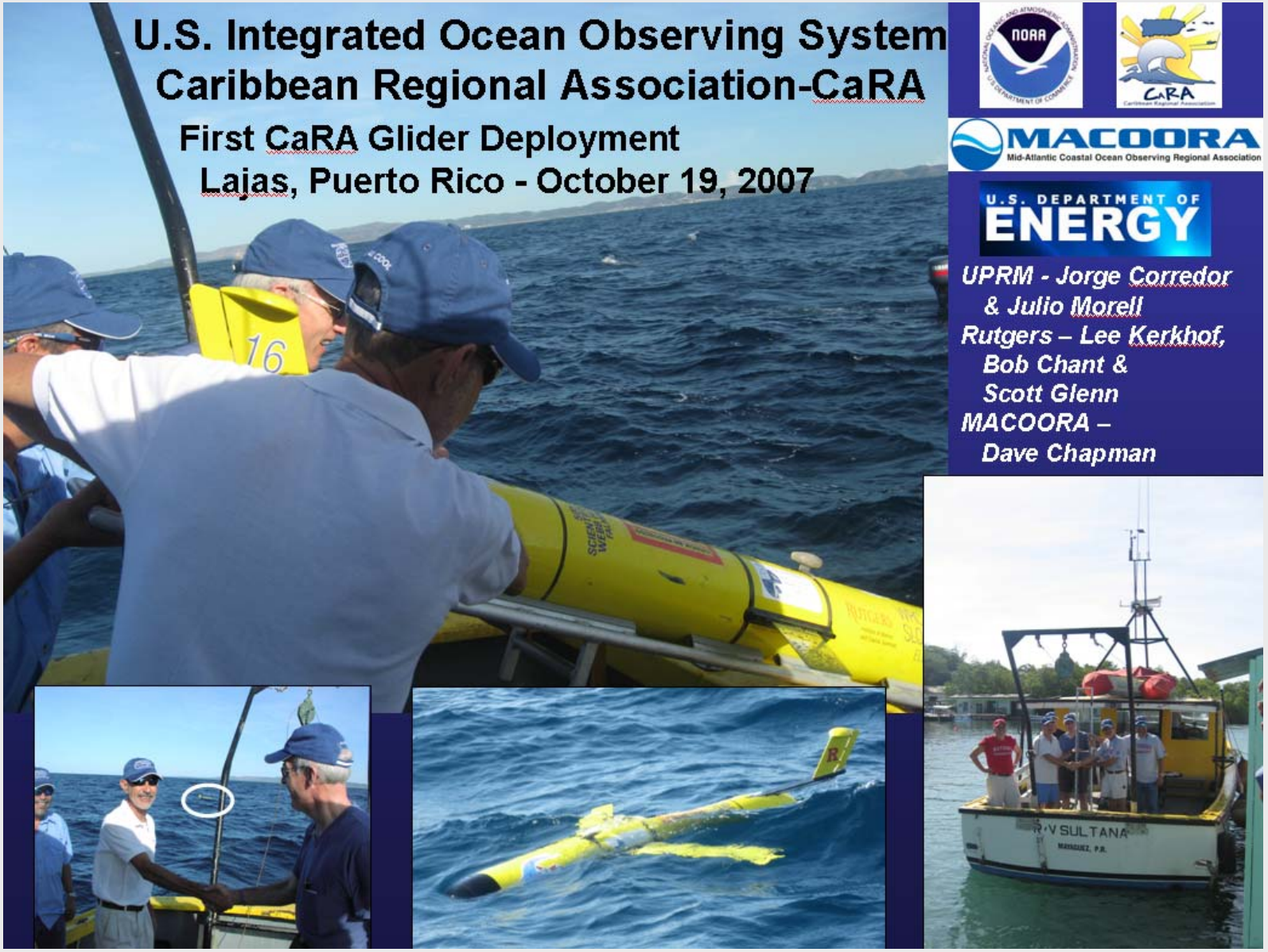








Webb Technologies SLOCUM Glider Demonstration Project



Current Activities:
CaRA VI Pilot Projects

Three pilot projects were planned in the recent period:

- The deployment of an AWAC (Acoustic Wave and Current Profiler) in/near important shipping channel on St. Thomas. Partners would be the VI Port Authority, the West Indian Company (cruise port) and the University of the Virgin Islands.

- The creation of VI Mesonet to serve the tourism and marine transportation sectors (initially) using the skills facilities and services of Weatherflow®. The USVI Department of Tourism and several resorts have been in the initial interest group.

- The development of a local VOS by outfitting ferries and other vessels with sensors to measure hydrographic and atmospheric variables as well as bathymetry when possible.

Interaction/joint work with other federal agencies

- DHS will provide limited funding for preparatory activities for the establishment of a HF radar network in PR and USVI
- CaRA attends the USCG Harbor Safety & Security Committee meetings.
  - This venue is being used for consultations on buoy emplacement sites, HF radar emplacement sites and harbor-scale model development
- How can NOAA IOOS best support you in engaging other Federal agencies?
  - Make other agencies aware of RA's existence and role (There are several new agency initiatives underway in the region that are not coordinated).

Sources of funding

- RA plans/efforts to match IOOS dollars with funding from other sources
  - What sources, and in what areas of work
  - See above UPRM & UVI contributions
  - Conversations underway for UPR system matching funds for observing system

- How can the NOAA Program Office help?
  - Establish formal mechanism for local matching funds. UPR can provide match but must be requested /endorsed by agency

RA Cooperative Agreements

- Milestones and status
  - CaRA formalization
    - Dec 4. CaRA celebrated its inaugural meeting at the Caribe Hilton Hotel in San Juan Puerto Rico on Dec 4, 2007.
    - **Web page development:**
      - CariCOOS web page, providing links to most regional ocean data streams, products and forecasts in now available online at: http://caricoos.org
      - Both Spanish and English versions of CaRA's web page can be accessed at: http://cara.uprm.edu

Milestones and status
Stakeholder Engagement
Workshops & Outreach Meetings

- Steering Committee meetings
  - University of the Virgin Islands St. Thomas February 2006
  - San Juan, PR 27 April 2007 Hotel Condado Plaza
- CaRA Academic Sector Meeting – Club Nautico de Ponce June 2006
- Meeting with “GEOAMBIENTE” of Puerto Rico March 2006.
- Meeting with National Weather Service May 2006
- Royal Caribbean Cruise Line ship *Explorer of the Sea* July 2006
- CaRA Governance Meeting San Juan, Puerto Rico January, 2007
- CaRA Government Sector Meeting – DNRA July 2006
- Department of Natural Resource Meeting June 2006
- Transportation Sector (MacCallister Towing) – Sept 2007
- UPRM Administration Meeting - June 2007
- Puerto Rico Tourism Company meetings Aug 2007
- PR Seismic Network Tsunami Workshop for Ship Operators and Port Facilities. Sept 2007
- PR Sport Fisherman Association Club Nautico de Boqueron Nov 2007
- Inaugural activity CaRA-UPRM Alliance for Coastal Modeling and Prediction Mayaguez Resort & Casino Oct 2007
- PR Environmental Quality Board Nov 2007
- Asociacion de Navieros de PR Nov 2007
- Inaugural meeting & First General Assembly Caribe Hilton Hotel in San Juan Puerto Rico on Dec 4, 2007
- 2nd Stakeholders Council Meeting April 2008
- Harbor Safety & Security Meeting San Juan PR March 2008
- Harbor Safety & Security Meeting Guayama PR March 2008
- Port of Ponce April 2008
- Engagement through a structured canvassing and rapid assessment program carried out by CIEL – Interdisciplinary Center for Littoral Studies – 41 interviews

Workshops & Outreach Meetings (CaRA-VI)

- *National Tsunami Hazard Mitigation Program Workshop* CaRA/NTHMP workshop with the Virgin Islands Territorial Management Agency June 13 – June 14, 2007
- *Ocean Observing Systems, Security and CaRA Workshop* June 25, 2007 UVI's MacLean Marine Science Center
- *Grants Planning Workshop: FY2008 Integrated Ocean Observing System Regional Association Support and FY2008 Implementation of Regional Integrated Ocean Observing Systems* August 6 - 7, 2007, UVI MacLean Marine Science Center
- *Weatherflow Demonstration Project Workshop* August 8, 2007 UVI MacLean Marine Science Center
- Assisted the V.I. Territorial Emergency Management Agency (VITEMA) in preparing grant proposals to the NOAA/NWS for NTHMP funds.
- Helped develop communication links among USVI ferry operators, NOAA officials and National Weather Service officials.
- Discussed with official of the V.I. Water & Power Authority means through which CaRA and its stakeholders can play a role in the re-consideration of certain ocean-based energy conversion alternatives for the USVI (e.g., OTEC).

CaRA Outreach

36 laRegata | Año 11 Número 1 — Medioambiente

Observaciones del océano al servicio del pueblo

Por Dr. Jorge Corredor
Profesor e investigador co-gestor de ARCa

¿Soplará?, ¿Cómo estará la "marejá"?, ¿Estará "chopeao"? ¿Pa' dónde estará el "chorro"? o ¿Estará clara el agua?... Estas son algunas de las preguntas comunes en la mente de aquellos que van al mar, ya sea para trabajar o divertirse. Lo que no hay son respuestas claras.

Parecerá increíble, pero a pesar de ser una isla con una amplia zona costera, no hay un sólo instrumento que indique el tamaño de las olas, las corrientes o la calidad

en realidad a través del proyecto Sistema Integrado de Observación Oceánica Costera para el Caribe (CarICOOS, por sus siglas en inglés) financiado por

10 The San Juan Star — Wednesday, December 5, 2007 — Local News

DNR–UPR pact aims to gather ocean monitoring data

BY JON RUST
Of The STAR Staff

The Department of Natural Resources and University of Puerto Rico signed an agreement Tuesday to work

is essentially a "system of systems" that will bring together ocean-related information from numerous federal and local entities.

The UPR, for example, may monitor coral reefs, while the DNER surveys water quali-

Unen esfuerzos para observar el Caribe

Por Margarita Santori López
msantori@uprm.edu
PRENSA RUM

oficina de prensa noticias y eventos
unen esfuerzos para observar el caribe
margarita santori lópez, prensa rum

viernes, 18 de enero de 2008

Mejorar las predicciones del tiempo en el Caribe, así como proteger y restaurar los ecosistemas marinos con mayor eficacia, y optimizar la seguridad y la eficiencia de las operaciones marítimas en esta zona, son sólo algunos de los objetivos de la Asociación Regional del Caribe (ARCa), una organización que busca establecer un sistema integrado de observación costera en la región.

34 laRegata | Año 11 Número 2 — Medioambiente

Las olas internas del Canal de La Mona

Por Jorge E. Corredor, Ph.D.
UPRM - Departamento de Ciencias Marinas

Los pescadores siempre lo dijeron "en el bajo del Pichincho, el marlin jala en días de luna llena". Este bajo, localizado en una cordillera submarina en medio del Canal de La Mona, forma una frontera de encuentro entre el régimen de mareas semi-diurno del Océano Atlántico y el diurno del Mar Caribe.

En 1995, los profesores Julio Morell, Jorge Capella y este servidor, como ávidos pescadores y oceanógrafos prácticos, conseguimos financiar una expedición para dilucidar el móvil físico de esta singular agregación pesquera. En barcos del Departamento de Ciencias Marinas, logramos para nuestra gran satisfacción, medir una ola que lo explica. ¡Pero... qué ola! Una ola de 50 metros (164 pies) de altura que dura

¿Para esto utilizamos un vehículo autónomo submarino, embarcaciones del Departamento de Ciencias Marinas UPRM y el barco *OSV BOLD* de la Agencia de Protección Ambiental (EPA).

Aprovechamos nuestra colaboración en el programa del Sistema Integrado de Observación Costera Oceánica de NOAA con colegas de la Universidad de Rutgers (RU), y a bordo de barco de investigación *SULTANA* de UPRM, lanzamos al mar el vehículo RU16 propiedad de su Laboratorio de Observación Costera Oceánica (COOL, por sus siglas en inglés) al sur de La Parguera.

El RU16 tenía la misión de navegar hasta la boca sur del Canal y, una vez allí, remontar

18 EL VOCERO / miércoles, 5 de diciembre de 2007 — Locales

En Puerto Rico e Islas Vírgenes

Estudio uniforme de zonas costeras

Maricelis Rivera Santos
EL VOCERO

La zona costera de Puerto Rico y las Islas Vírgenes Estadounidenses serán estudiadas mediante un sistema integrado de observación que permitirá a los gobiernos

una organización de usuarios de los recursos marinos la que maneje los datos.

Morell mencionó que desde tiempos precolombinos Puerto Rico ha tenido la mayor parte de sus asentamientos en las costas dada la situación geográfica del interior muy escarpada.

Aseveró que con el uso de datos actualizados de topografía, batimetría y un nuevo modelo podrán determinar qué áreas podrán ser afectadas para que el Gobierno desaloje en la costa de una forma más eficiente para propósitos de seguridad de vida.

Ciencia y Tecnología

Retrasado el Caribe en observación oceánica

Por Jorge E. Corredor / Especial para El Nuevo Día

- Diversos sectores trabajan para establecer sistemas efectivos.

RA Coordination: Cooperative Agreements

Summary of overall progress: How are you doing? CaRA is now formally established. CarICOOS implementation project will allow initial observing assets emplacement to meet concrete stakeholder data needs (while (re)-gaining credibility)

- Strong outreach to all stakeholder sector in PR and USVI has resulted in recognition of CaRA
- Initial engagement & outreach effort provided foundation for CarICOOS system design & RCOOS Implementation proposal

RA Coordination: Cooperative Agreements

What will change with the new RA grant in FY08? Objectives of the RA and plans for the near-term FY08-12:

- Enhancing proactive participation and diversity within the Governance Structure and strengthening the Regional Association and procuring further accessions to the CaRA MOA from all stakeholder sectors.
- Continued revision and refinement of CaRA's draft business plan by the Stakeholder Council and Executive Committee, consultants and legal counselor.
- Continued and expanded assessment of regional priorities for observing system information including data format and exchange requirements.
- Continued refinement and prioritization of CaRA's observing system design based on initial results from observing assets.
- Development and reformatting of CaRA's website to conform to a common identity with other IOOS components following NFRA recommendations
- Enhancement of stakeholder recognition and trust through rapid development of appropriate, effective avenues of access to useful integrated data products that meet expressed CaRA stakeholder needs

New directions, partners, etc.?

- NOAA CoastWatch, a partner to CaRA in the current proposal, will assist in the development of regional remote sensing products
- Outreach to international neighbors (BVI, Dominican Republic, Colombia)
- Partner with SECOORA and GCOOS on appropriate DMAC and education/outreach activities

RA Future Development

RA views on function and performance metrics How can we best measure outputs and outcomes?

- Must develop tools to assess:
  - value and quality of products
  - Delivery to and use by stakeholder community

RA Future Development

- Summary of top five priorities for development of RCOOS capabilities with cost estimates
  - HF radar network for PR and USVI Cost: $1,750,000
  - 4 Additional coastal buoys for VI and Mona Passages Cost: $ 400,000
  - Network of inshore water quality buoys for PR and USVI Cost: $1,500,000
  - Support for long-term ocean stations (Caribbean Time Series, Anegada Climate Tracer Study) for climate change assessment ($150,000/y)
  - Multi RA Glider network for climate change & hurricane studies ($ 5,000,000)
  - Sustained Ports bathymetry program ($100,000/y)

RA Views on Regional and National IOOS

- RA needs with regard to the integration of regional and national planning efforts
  - DMAC parameters, guidelines, common framework must be set at an early date
- RA expectations for development of the "national backbone" of observations
  - In situ – Augmentation of NDBC buoy network to include buoys upstream (east) of PR & USVI
  - Remote sensing – Continued development of the NOAA CoastWatch Caribbean/Gulf of Mexico Node

Cross-regional Coordination

- Discuss existing and potential coordination with other IOOS RAs
  - On regional efforts/issues?

  CaRA, GCOOS and SECOORA share climate/ecosystem commonalities and connectivity. Concerted approaches are needed for specific problems.
  - On a national scale?
    - A common identity
    - Sharing expertise

Best Practices and Lessons Learned

Describe problems encountered to date and their resolutions

- Lack of expertise within the region. We are implementing an expert visitors program which has given rise to strong partnerships for the implementation proposal and will result in increased local capacity.

Parting Thoughts

- What support or information do you need from NOAA that you are not currently receiving?
- Formalization of NOAA “backbone” contacts for RAs (eg NDBC)

Parting Thoughts

- How can NOAA IOOS best receive regular updates or information from the RAs?
  - RA and partner achievements, news items, expressions of stakeholder support, engagement of new stakeholders
    - NOAA might set up a server where we can log our activities…..
  - How can NOAA IOOS best understand (and articulate) how RAs support the national system?
    - With this kind of dialogue
    - Supporting engagement with federal agencies such as our collaboration with NWS
    - Field visits by NOAA IOOS personnel are important for familiarization
- Other parting thoughts?
- Regarding FY2008- 11 RCOOS Implementation we note:
- " It must be stressed that although the strategies and approaches presented …minimize modification of program elements during the first program year they do not provide for a similar reduction in funding level in subsequent years. "