



BOEM
BUREAU OF OCEAN ENERGY MANAGEMENT

BOEM's Role in Developing Use-Inspired Monitoring Programs

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Gulf of Mexico Region

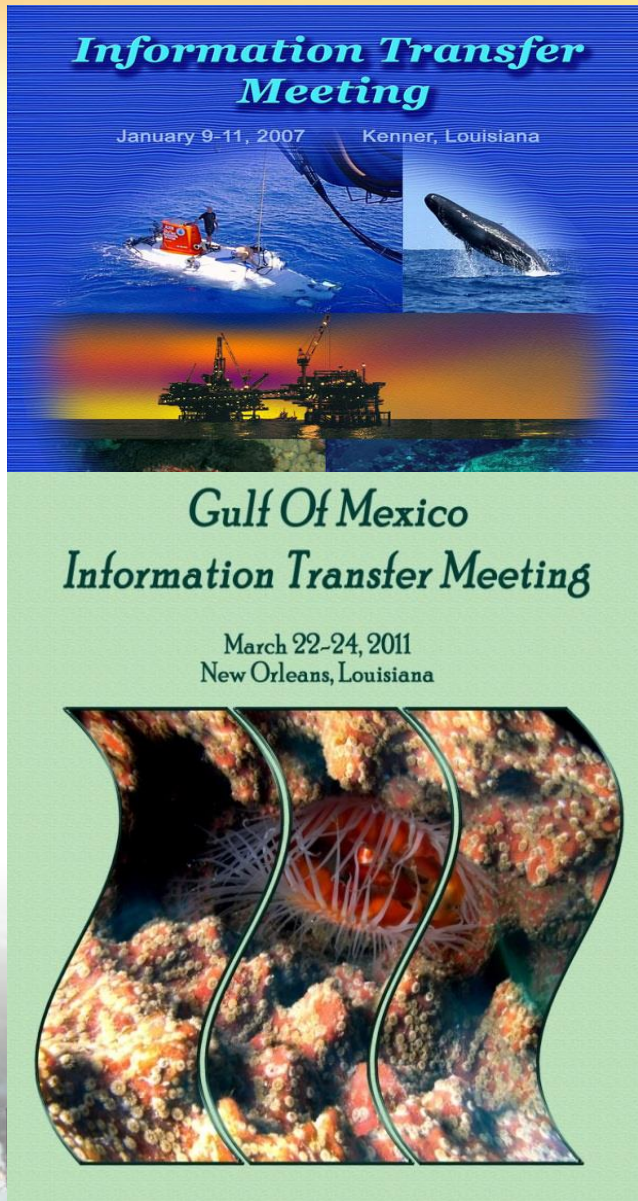
Bureau of Ocean Energy Management

Environmental Studies Program

- >40 years of biological, physical, and social science research in the Gulf of Mexico
- Over 350 completed studies worth \$262M total
- History of *Baseline, Fates & Effects, and Monitoring* Studies
- Coordinating on *post-Deepwater Horizon* studies for ocean observing/monitoring



Importance of the ITM



- Gulf of Mexico ITM regularly held since 1980
- Purpose to foster sharing results, methods, and ideas related to environmental studies
- Serves dual role of information sharing across study PIs and broader stakeholder community
- ITM especially important now ...

As multiple funding programs in GoM work to coordinate and partner on related science needs.



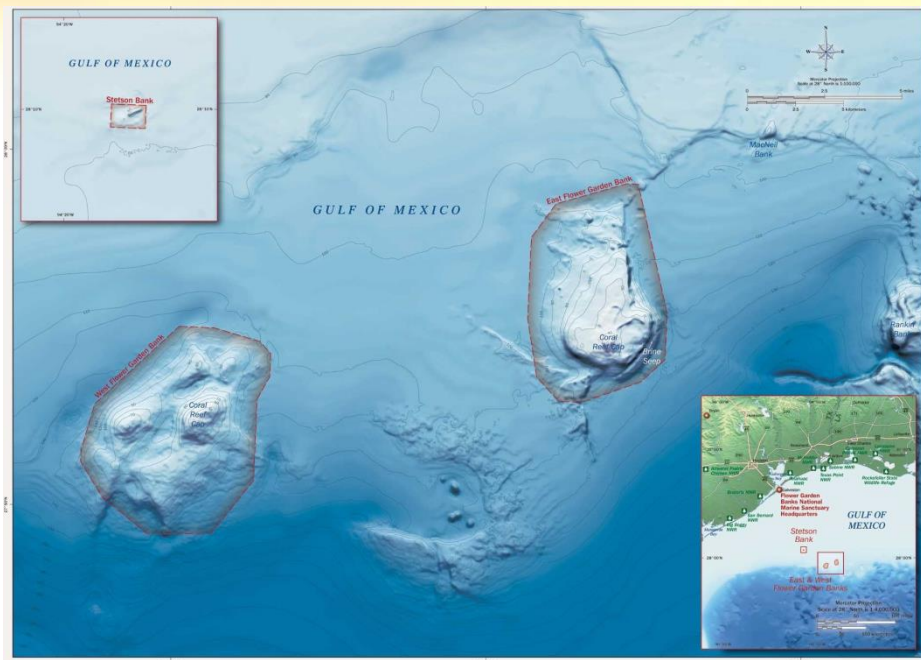
Strategic Framework

- Identifies **Long-Term Monitoring** as a Strategic Science Need
 - BOEM needs to know Information from monitoring on the environmental impacts of its authorizations over the entire time during which those impacts will occur, including potential future decisions.
- Mandated by **Outer Continental Shelf Lands Act (OCSLA)**
 - Specifies monitoring the human, marine, and coastal environments to provide time series for identifying significant changes in environmental quality.
- **Criteria for Monitoring:** (1) Need for Information in BOEM Decision-Making, (2) Sound Research Concept, (3) Partnerships, (4) Cost-Effectiveness

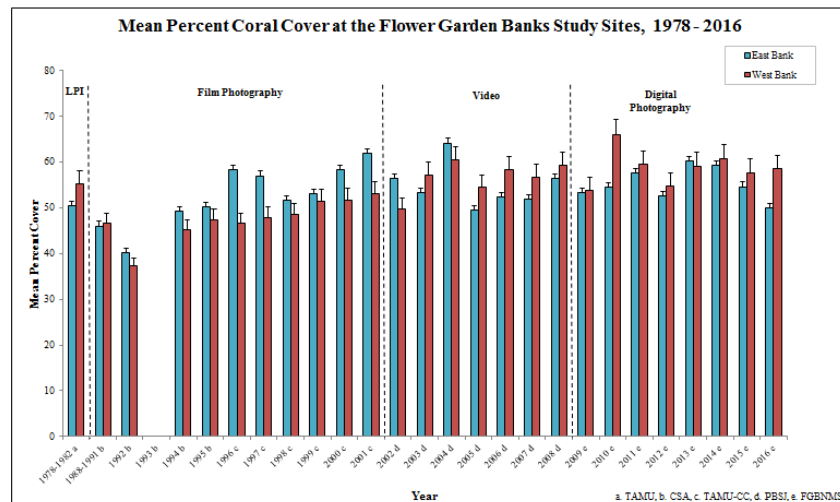


Flower Garden Banks Long-Term Monitoring

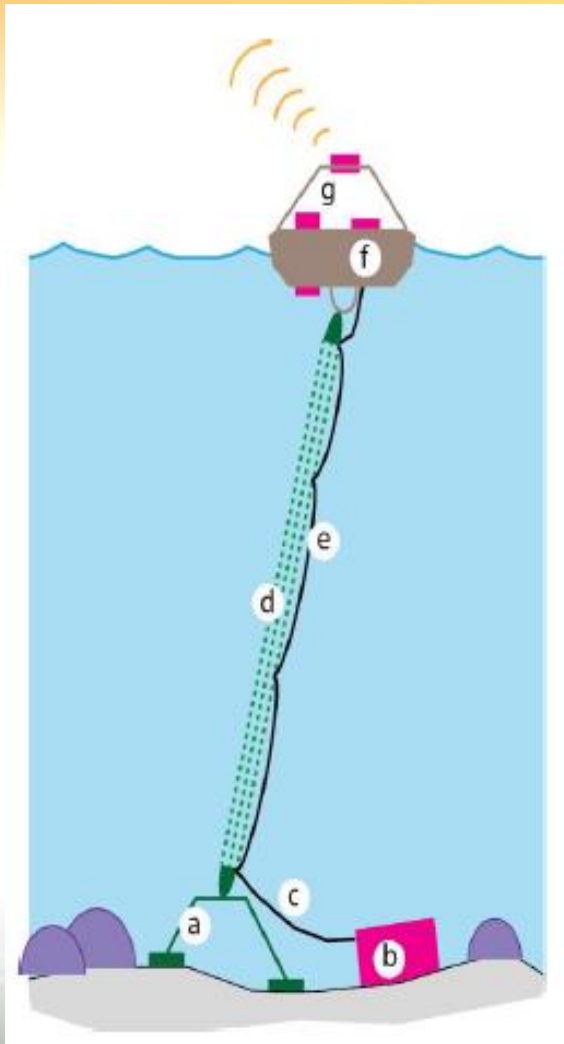
East and West Flower Garden Banks



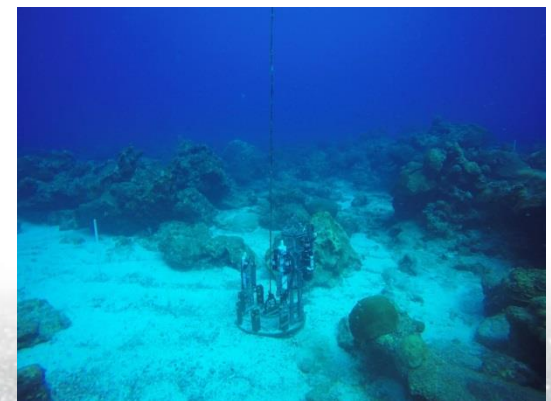
- Monitoring developed over a period beginning in 1970's
- BOEM recognized need for baseline coral assessment
- Developed into partnership with NOAA FGBNMS in 1980's
- No significant declines have been detected in coral cover



Flower Garden Banks Long-Term Monitoring



- Newly adding ocean acidification sentinel site
- A surface and bottom mooring will measure carbonate chemical dynamics at and above the reef crest
- Partnership between BOEM, Shell, TAMU, and NOAA

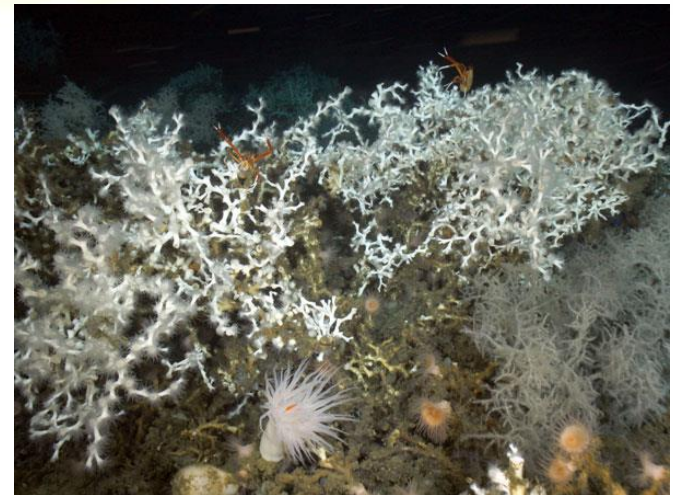


History of Deepwater Studies

Chemosynthetic Ecosystems (1984)



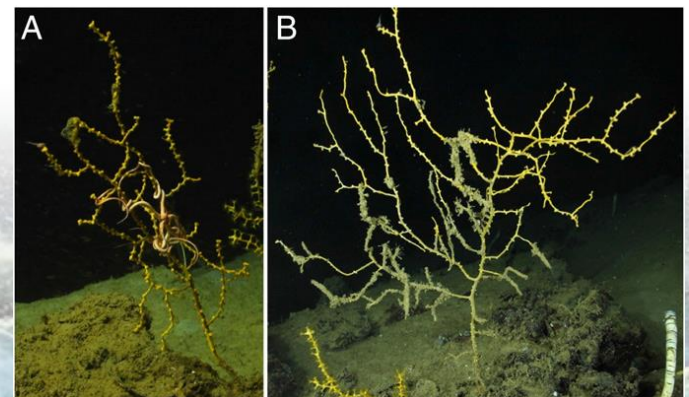
Deepwater Hard Bottoms
(2005, 2007, 2012)



White et al (2012)
Deepwater Horizon Impacts



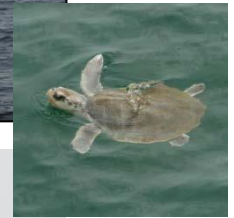
Fisher et al. (2014)
Deepwater Horizon Impacts



Protected Species Observations

Explosive Removal of Structures and G&G Activities

- Protections under Endangered Species Act and Marine Mammal Protection Act
- BOEM and BSEE collect data on species distributions and potential effects of offshore energy activities
- Protected Species Observer (PSO) Program is required as a seismic survey mitigation measure
- BOEM is funding a new Passive Acoustic Monitoring Program in the northern Gulf of Mexico to be deployed during the next year



Protected Species Observations

Assessing Broad-Scale Abundance and Distribution
of Marine Mammals, Sea Turtles, and Seabirds
in the Gulf of Mexico:
The GoMMAPPS Field Program

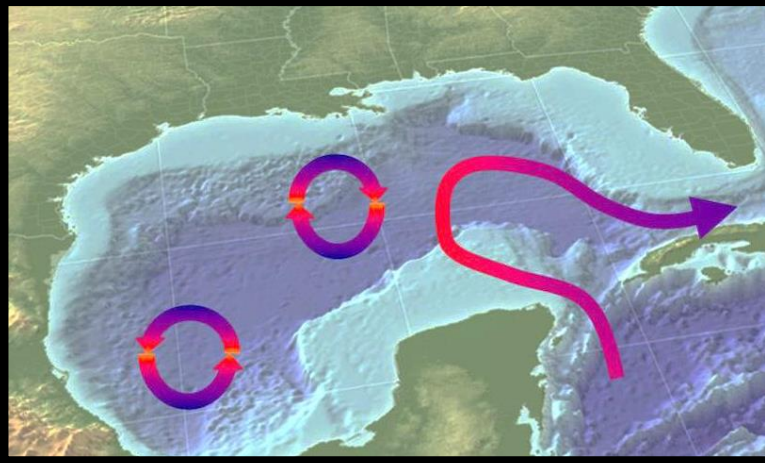


**Gulf of Mexico Marine Assessment Program
for Protected Species**



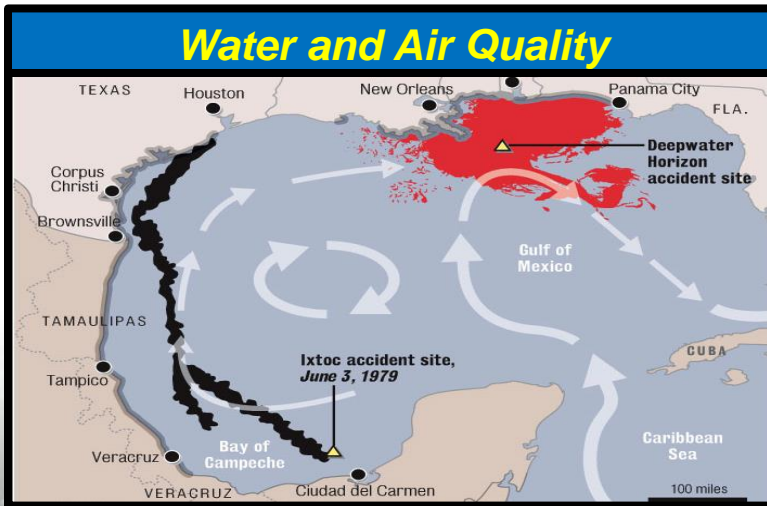
Physical and Chemical Sciences

Physical Oceanography



- Protections under Clean Water Act, Clean Air Act, & BOEM Regulations.
- BOEM studies in physical oceanography inform Oil Spill Risk Analysis modeling.
- Large-domain models of entire Gulf of Mexico are used for both oil spill and air quality modeling.
- History of collecting in situ validation and time series measurements.
- Physical measurements from oil platforms available at NDBC.

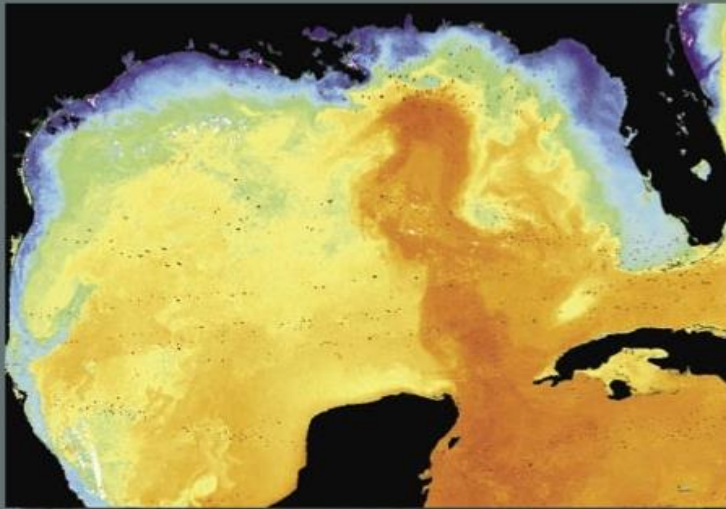
Water and Air Quality



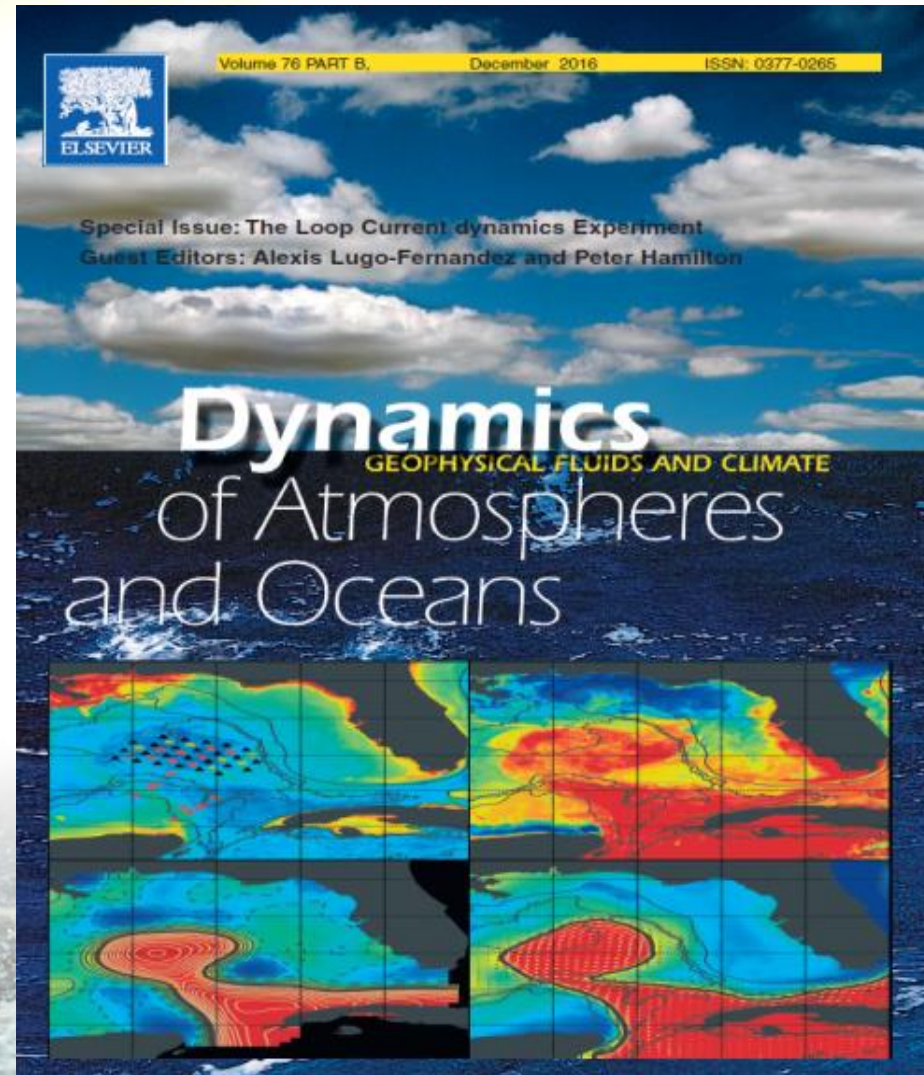
Physical Oceanography

Loop Current Circulation - Dedicated Issues

Circulation in the Gulf of Mexico *Observations and Models*

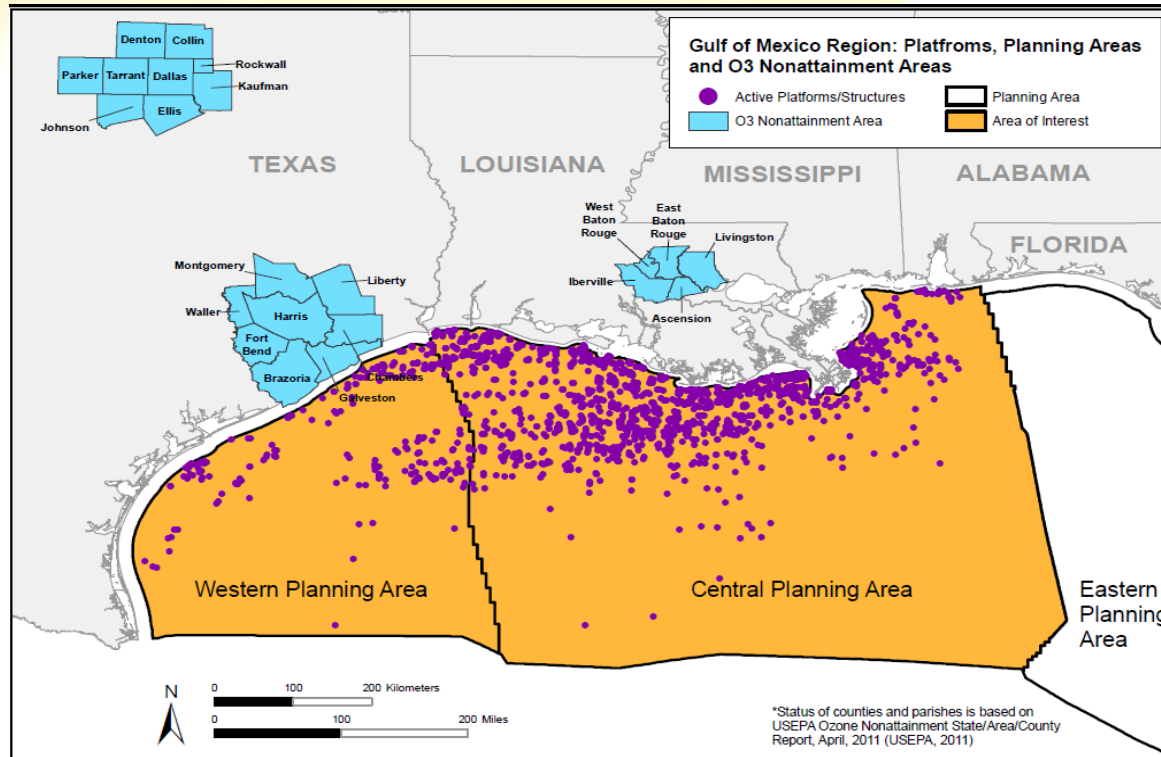


Wilton Sturges, Alexis Lugo-Fernandez,
Editors



Air Quality Studies

Atmospheric Pollutant Transport Monitoring and Modeling



- BOEM requires operators to regularly submit emissions through the Gulfwide Offshore Activities Data System (GOADS)

Social and Cultural Sciences

Social Anthropology



- Analysis of effects on human society as required by National Environmental Policy Act
- BOEM conducts social, economic, and cultural impact studies, which include:
 - ❖ Coastal infrastructure
 - ❖ Recreation
 - ❖ Demographics
 - ❖ Labor
 - ❖ Archaeology
 - ❖ Environmental justice
- Currently exploring new approaches to sociocultural monitoring

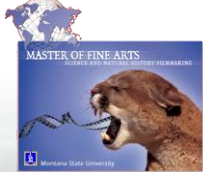
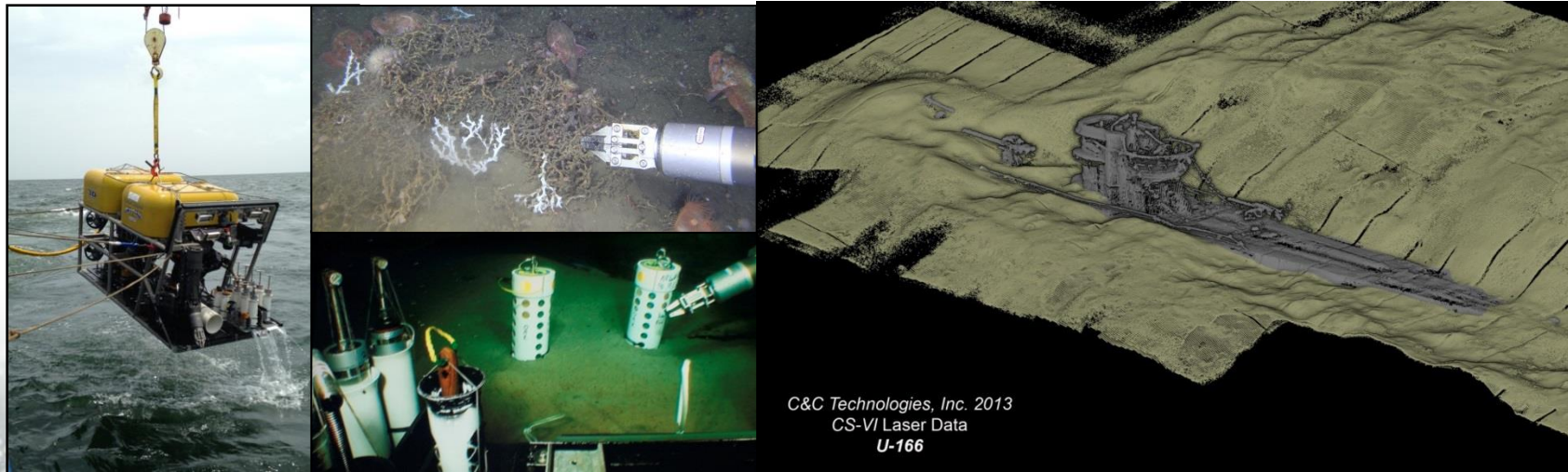
Economics



Social and Cultural Sciences

Gulf of Mexico Shipwreck Corrosion, Hydrocarbon Exposure, Microbiology, and Archaeology Project (GOM-SCHEMA)

- Compared microbial communities on 19th century historic shipwrecks in heavily DWH-spill impacted, moderately impacted, and unimpacted areas
- 3D laser and sonar scans of shipwrecks documented condition to monitor and quantify deterioration over time
- New study will monitor for changes by comparing 2018 samples with those collected previously



Marine Minerals Program

Noncompetitive Negotiated Agreements:

Provide OCS mineral resources to local, State, and Federal agencies for beach nourishment, coastal restoration, and shore protection/risk reduction projects.

- A science-based program that responsibly manages development of America's **offshore non-energy resources**.
- Proactive **resource management** ensures long-term success of restoration and community protection programs.
- Utilizing tools developed through **applied science** to address unique challenges.



Marine Minerals Program

Provide the information needed to predict, assess, and manage impacts from offshore marine mineral exploration, development, and production activities on human, marine, and coastal environments

MONITORING EXAMPLES



- Behavioral Patterns of Sea Turtles in Northern GOM
- WAVCIS Ocean Observing Station in Louisiana
- Borrow area evolution monitoring and modelling



Emerging Strategic Science Question: Offshore Renewable Energy



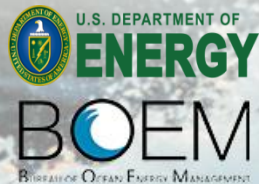
Wind Energy



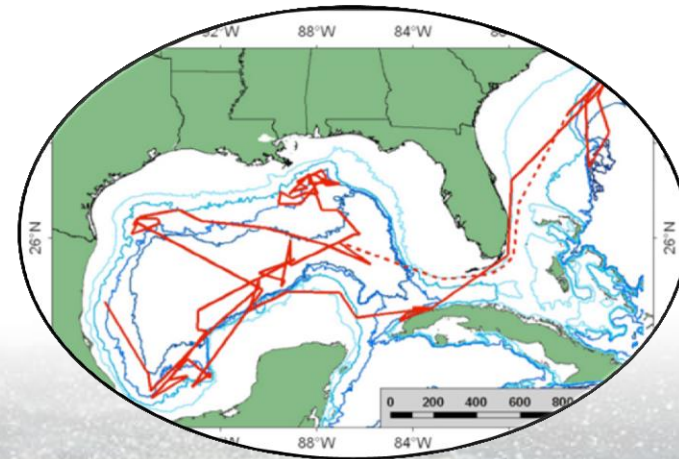
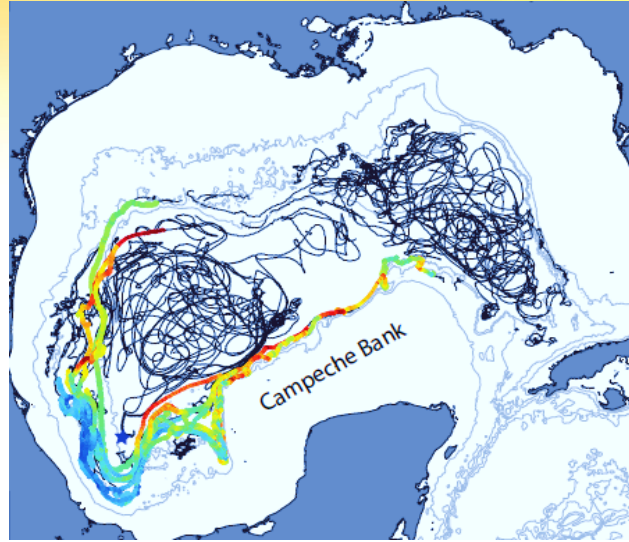
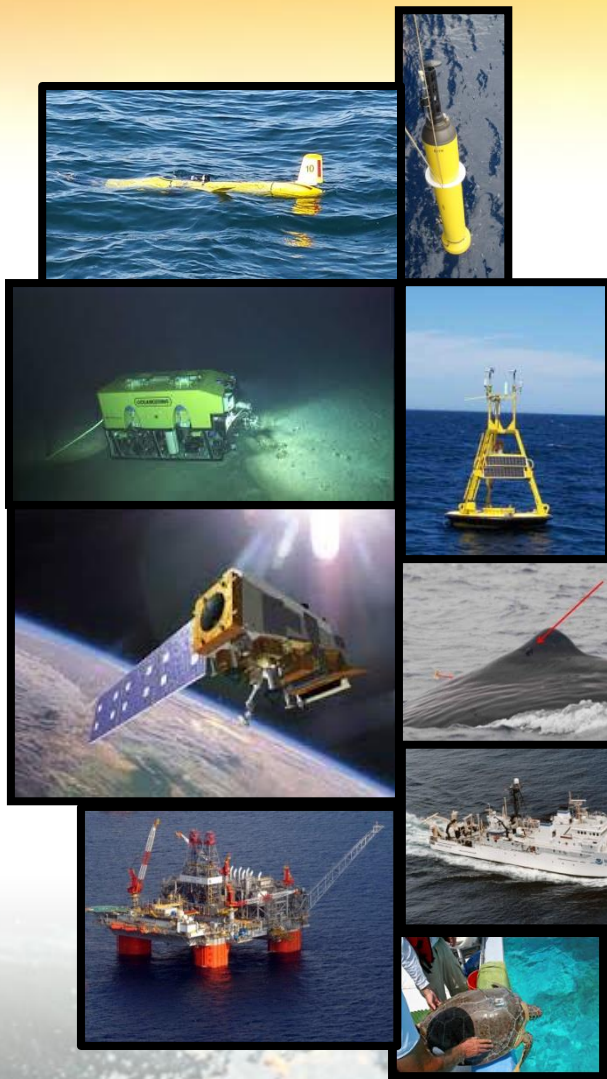
Hydrokinetic Energy



Wave Energy



ONE Gulf: International Collaborative Research



Past Collaborative Awards for the Gulf of Mexico OCS Region

Sperm Whale Seismic Study

2004 DOI Cooperative Conservation Award

WWII Shipwrecks and the Artificial Reef Effects

2006 DOI Cooperative Conservation Award

2007 NOPP Excellence in Partnering Award

Investigations of Chemosynthetic Communities on the Lower Continental Slope of the Gulf of Mexico

2006 & 2007 NOAA OE Signature Expeditions,
Expeditions to the Deep Slope

2007 DOI Cooperative Conservation Award

Flower Garden Banks Long-Term Monitoring

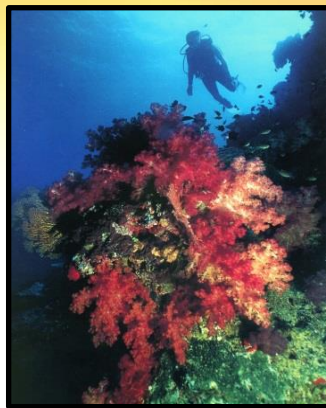
2009 DOI Partners in Conservation Award

Battle of the Atlantic Expedition

2009 DOI Partners in Conservation Award

History of the Offshore Oil & Gas Industry in Southern Louisiana

2010 DOI Partners in Conservation Award



Archaeological Analysis of Submerged Sites on the GOM Outer Continental Shelf

2011 DOI Partners in Conservation Award

Exploration and Research of Northern GOM of Deepwater Natural and Artificial Hard Bottom Habitats with Emphasis on Coral Communities: Reefs, Rigs, and Wrecks

2011 NOPP Excellence in Partnering Award

2011 DOI Partners in Conservation Award

EcoSpatial Information Database (ESID)

2012 American Council of Engineering Companies
Engineering Excellence Grand Award

Developing Environmental Protocols & Monitoring to Support Ocean Renewable Energy & Stewardship

2013 DOI Partners in Conservation Award

Ocean Renewable Energy Stewardship Partnership

2014 DOI Partners in Conservation Award

Atlantic Canyons: Pathways to the Abyss

2013 DOI Partners in Conservation Award

2015 NOPP Excellence in Partnering Award





Environmental Studies Program

- Environmental monitoring is key to informing adaptive management of the Gulf ecosystem
- Partnerships among academic, State, Federal, and NGOs are critical for sustained observations
- Post-DWH studies planning requires close coordination with new funding programs
- Strategically broadening scope of monitoring to include Gulf Large Marine Ecosystem



Subcommittee on Ocean Science and Technology
Interagency Working Group
on Ocean Partnerships