



2015 Gulf of Mexico

Oil Spill & Ecosystem
Science Conference



February 16-19, 2015

Houston, Texas

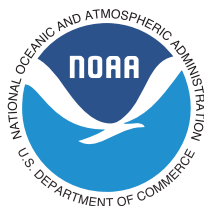
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THANK YOU TO OUR SPONSORS!



GULF RESEARCH PROGRAM

National Academy of Sciences
National Academy of Engineering
Institute of Medicine
National Research Council



The Gulf of Mexico has witnessed significant progress in research and restoration over the past five years. The 2015 Conference was an opportune time to reflect on the current state of the Gulf and recent scientific discoveries and determine where we go next. Located in Houston, the hub of oil and gas activity for the US, the Conference themes emphasized the impact of the research and application of published research findings, asking “What have we learned, what does it mean and how can it be used?” The conference program was designed to provide attendees with a broad range of content highlighting current science, management issues and new directions.

WE WOULD LIKE TO THANK THE MEMBERS OF THE EXECUTIVE COMMITTEE FOR THEIR TIME AND DIRECTION IN PLANNING THE CONFERENCE.

Charles Wilson (Chair), *Gulf of Mexico Research Initiative*

Michael Carron, *Gulf of Mexico Research Initiative*

Alyssa Dausman, *U.S. Geological Survey*

Allen Dearry, *National Institute of Environmental Health Sciences*

Chris Elfring, *Gulf Research Program of The National Academies*

Peter Koufopoulos, *U.S. Food and Drug Administration*

Paul Sandifer, *National Oceanic and Atmospheric Administration*

David Shaw, *Gulf of Mexico Research Initiative*

Andrew Shepard, *Gulf of Mexico University Research Collaborative*

Suzanne van Drunick, *Environmental Protection Agency*

Denis Wiesenburg, *Gulf of Mexico Research Initiative*

THE CONFERENCE WOULD ALSO LIKE TO THANK THE FOLLOWING PARTNER ORGANIZATIONS:

The Gulf of Mexico Research Initiative Management Team provided logistical and programmatic support throughout the conference.

NOAA's Coastal Services Center provided pre-conference agenda development and onsite assistance with session summaries.

Texas Sea Grant volunteers assisted with onsite registration and check-in.

EXECUTIVE SUMMARY: CONFERENCE OVERVIEW

The Gulf of Mexico has witnessed significant progress in research and restoration over the past five years. As the first wave of oil spill research began to summarize three years of results, Gulf restoration science programs were rolling out requests for proposals. The 2015 Conference was an opportune time to reflect on the current state of the Gulf and recent scientific discoveries, and determine where we go next.

The organizers and sponsors of the Gulf of Mexico Oil Spill and Ecosystem Science Conference share a goal to improve society's ability to understand the Gulf of Mexico ecosystem, including humans, to ensure its long-term environmental health. One important aspect of this goal is understanding the impacts of petroleum pollution and related stressors on the marine and coastal ecosystems and human populations, and applying that information to future response, mitigation, and restoration following spills.

The goal of the 2015 conference was to highlight oil spill and ecosystem science research results with a focus on the five years since the Deepwater Horizon (DWH) oil spill. The conference sought to answer the questions "What have we learned, what does it mean and how can it be used?" with an emphasis on the impact of the research and application of published research findings. Chairs dedicated session time to discuss and answer these questions. Session summaries were presented for a facilitated discussion during the closing plenary session.

The conference was planned and sponsored by a group of fourteen partners from academia, federal agencies and non-governmental organizations.

Program highlights include:

- A keynote address by Dr. Rick Spinrad, Chief Scientist for the National Oceanic and Atmospheric Administration
- Presentations from the eight Gulf of Mexico Research Initiative consortia (listed on page 44)
- Nineteen oral and poster sessions on the following topics:
 - Dispersant-oil interactions
 - New dispersant technologies and improved response tools
 - Responses to deep blow-out and high pressure
 - Microbial ecosystems
 - Data management, modeling and decision making
 - Impacts on benthic communities, coastal ecosystems and ecological processes
 - Public health and socio-economics
- Closing plenary discussion facilitating individual session summaries, emphasizing "Where do we go next?"

The conference also hosted nine associated meetings and events during the week, offering attendees the opportunity to learn about and discuss interdisciplinary topics not covered during the breakout sessions, such as long-lived marine vertebrates, genomics, scientific communications and strategic partnerships. A summary of each meeting and its outcomes is provided in Appendix III (page 46).

General information about the conference can be found at <http://2015.gulfofmexicoconference.org/>.

Scientific Sessions

The conference sessions were selected to provide attendees with a broad range of content that highlights current science, management issues and new directions. In keeping with the conference goals, accepted abstracts touched on "What have we learned, what does it mean and how can it be used?" and concluded with suggestions for future directions.

James D. Watkins Student Award for Excellence in Research

Two students were recognized with the James D. Watkins Student Award for Excellence in Research for outstanding student presentations at the 2015 Gulf of Mexico Oil Spill and Ecosystem Science Conference. The award strives to recognize outstanding research in order to cultivate the next generation of ocean scientists and encourage excitement for presenting their work.

The Student Award for Excellence in Research is named after Admiral James D. Watkins, a hero in the ocean community who passed away in 2012. Admiral Watkins lived a life of public service and his extraordinary influence on the ocean science community is immeasurable. Given Admiral Watkins' lifelong pursuit of encouraging and building the next generation of ocean scientists, it was most appropriate to name this award after him, as it recognizes excellent research as a way of motivating students to continue to excel in the field of oceanography.

The student recipients are:

Lindsey Dornberger (University of South Florida) – Ecosystem modeling: an approach to estimate effects of PAH on fishes

Kristina Deak (University of South Florida) – Cytokine expression patterns in red snapper and golden tilefish collected from the vicinity of the Deepwater Horizon oil spill in 2013-2014

The Scientific Sessions addressed one or more of the following conference themes:

- Understanding the dynamic physical processes of the Gulf of Mexico and related environment
- Understanding the chemistry of the Gulf of Mexico system and the evolution and interactions of pollutants introduced by humans in the coastal, open-ocean, and deep-water ecosystems
- Understanding the Gulf of Mexico ecosystem, including the sea floor, water column, coastal waters, beach sediments, wetlands, marshes, and organisms
- Technology developments for improved research and operations in the Gulf
- Understanding the impact of environmental health and function on public health and socio-economics
- Gulf of Mexico management and policy, including response, mitigation and restoration following environmental emergencies
- The role and practice of education, outreach and communication of the science and issues surrounding the Gulf of Mexico ecosystem and oil spill incidents
- Data Management and Informatics in the context of Gulf of Mexico ecosystem science and oil spill response, restoration and policy

A summary for each session is included in this report (page 8); Abstracts are available through a searchable online database.

The 2015 Conference, by the numbers:

Over 1000 people registered for the 2015 conference. There were 255 oral and 188 poster presentations, of which an estimated 69 oral and 99 poster presentations were given by students. Due to inclement weather in New England, several attendees, including presenters and meeting organizers, were unable to travel to Houston, resulting in slightly fewer presentations and posters than anticipated.

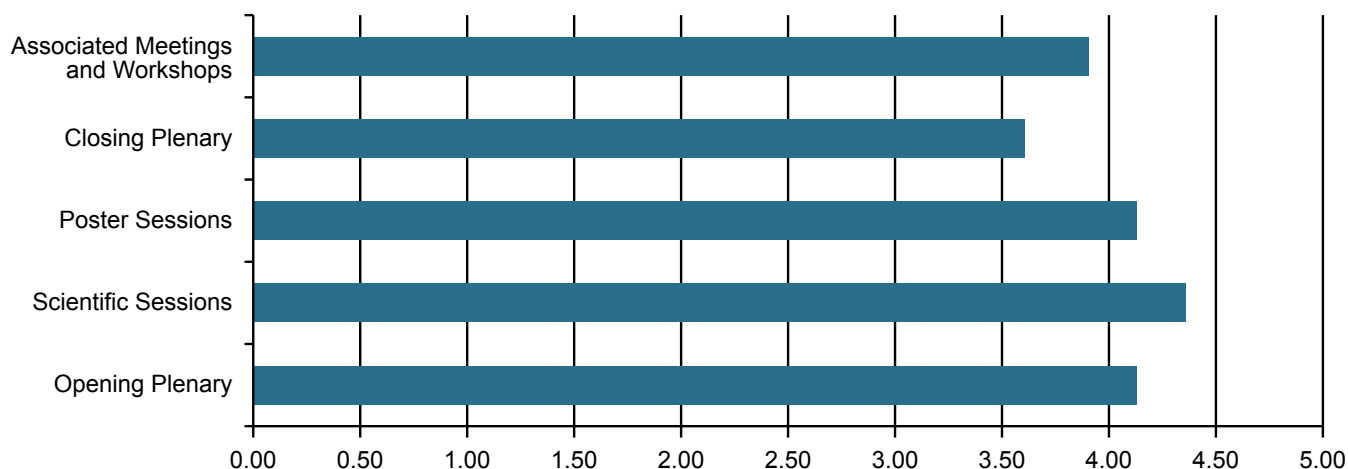
The conference drew a geographically diverse crowd, with attendees coming from 22 countries (Antigua and Barbuda, Australia, Bahrain, Brazil, Canada, China, Egypt, France, Germany, Italy, Kenya, Kuwait, Mexico, Netherlands, Nigeria, Norway, Portugal, Singapore, Spain, Switzerland, Thailand, United Kingdom), 35 states (Alabama, Alaska, Arizona, California, Colorado, Connecticut, Delaware, Florida, Georgia, Hawaii, Illinois, Indiana, Kansas, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, New Hampshire, New Jersey, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Virginia, Washington, and Wisconsin), and Washington, DC.

Conference attendees came from a diverse number of sectors as well. Over 145 universities (including 211 students), 80+ companies, and 10+ nonprofits and environmental groups were represented. Resource managers and other employees of government agencies (19 federal, 14 state and four foreign) also participated in the conference. Additionally, over 30 media representatives attended sessions and interviewed Gulf researchers (see Appendix IV on page 54).

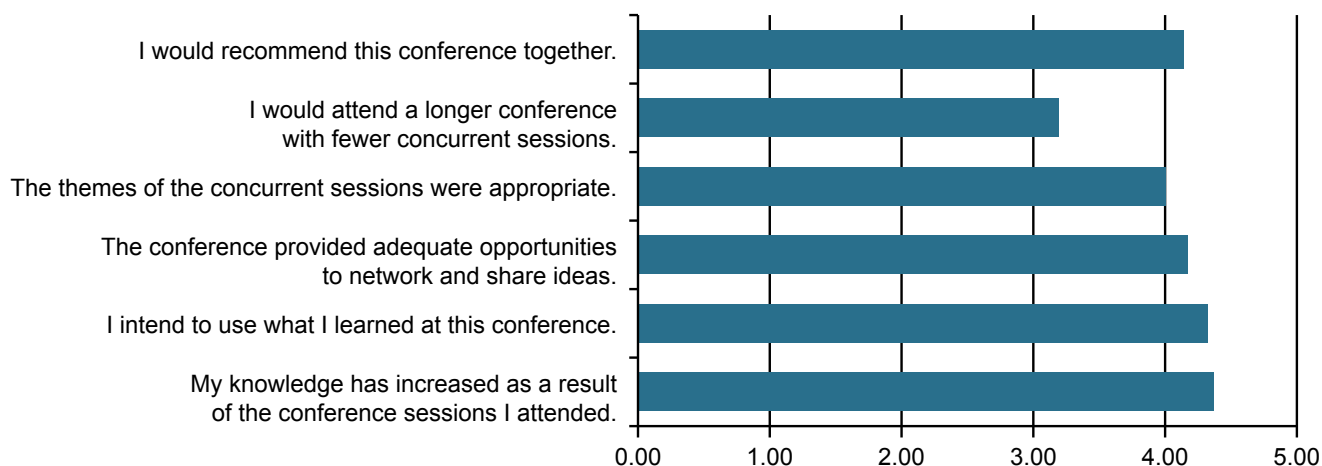
Attendee Survey Results

A 19-question survey was sent out to conference attendees to gather their feedback on the conference. Results from the 164 respondents indicate that overall, attendees were pleased with the conference program and activities. They felt that the opening and closing plenaries provided an introduction and update on the state of Gulf of Mexico research, and the high caliber of science presented during the sessions demonstrated the interdisciplinary nature of oil spill science. Attendees also enjoyed the opportunities to network and interact with fellow researchers from diverse fields.

Please rate the following conference sessions.



Please rate the following statements.



2015 OPENING PLENARY SUMMARY

KEYNOTE ADDRESS

Tuesday, February 17, 2015 8:30am

Keynote Speaker:

Dr. Richard Spinrad, Chief Scientist of NOAA

Addressing “The Role of Long-Term Science in Building Resilience in the Gulf of Mexico Region,” Dr. Spinrad described how transparency, coordination and communication are enabling long-term scientific studies and ecosystem assessments in the region which answer important questions such as the fate of DWH oil and its effects of ecosystems.

Through a number of tools which make research data available to stakeholders, Gulf science is informing restoration and response efforts. Whether these tools act as warehouses where data is assimilated and aggregated, improve access to and analysis of data, or help transform raw data into meaningful products and services, they are promoting transparency of research in the Gulf. To effectively communicate across communities, new models of public/private partnerships are developing tools to better understand the needs of a variety of Gulf communities and the reach and nature of their networks.

Restoration science, understanding the role of green infrastructure in dealing with disasters, new technologies (sensors, for example) and development of appropriate climate indicators are all integral to the science necessary for economic, social and ecological resilience in the region. Gulf research is contributing to all these areas.

What have we learned? There are a number of key messages coming from recent research. One is the need for transparency and the availability of data balanced with quality control associated with how we make that information available. Resources are also important -- not necessarily funding, but having the observational capabilities and scientific skill sets. You can't get baseline information after the fact; agencies must be prepared through sustained monitoring systems and knowing the expertise available. “Best available science” fosters robust discussions based on facts and helps our understanding of various certainties and uncertainties associated with the results we seek. Forums like this one and careful scientific leadership of post DWH research programs help to make sure the Gulf is the beneficiary of the best available science.

Consortia Summaries

The leaders of eight Gulf of Mexico Research Initiative RFP-I consortia provided Conference attendees with a summary of their respective findings over the past three years (see Appendix II for a list of consortia and presenters). In line with conference objectives they shared: What have we learned? What does it mean? And where should we go next? Videos of consortium presentations are available on the 2015 Conference YouTube channel (https://www.youtube.com/playlist?list=PLQEBZmTG-ZvfaK_UDEyH_96Yz2W-3iGch). More detailed presentations of specific consortia activities were provided as part of the scientific sessions.

2015 SCIENTIFIC SESSIONS

Session 001

DATA MANAGEMENT AND INFORMATICS SUPPORTING ECOSYSTEM SCIENCES

Tuesday, February 17, 2:00p – 5:30p, Plaza I

Matthew Howard, Texas A&M University*

Amy Merten, National Oceanic & Atmospheric Administration

Dave Reed, Florida Fish and Wildlife Conservation Commission

The Gulf of Mexico Research Initiative (GoMRI) is approaching the midpoint of its ten year investigation on the impacts of oil and dispersants on Gulf ecosystems. To date, a large amount of data has been produced by GoMRI-funded researchers and submitted to the GoMRI Information and Data Cooperative (GRIIDC). A similar amount of data is expected to be submitted in the remaining time. In addition, significant amounts of related data are expected to come from ongoing Deepwater Horizon (DWH) assessment and restoration activities, the 30-year National Academies Gulf Research Program, the RESTORE Act, and other programs. At this time of “abundant,” if not “big” data, the session’s organizers feel this is an opportune time for Gulf data managers to come together to share lessons learned and to conjecture on what may lie ahead.

**Session Organizer*

Session Participation

- Average 50 – peak 70
- Data Managers
- Informaticists
- Geographical Information System Experts
- Computer Scientists
- Modelers (Ecosystem)
- Scientists (Biologists, Earth, Acousticians)

Session Highlights

- A cultural shift towards Open Data Sharing has occurred in many research communities and more data are shared and shared earlier
- Researchers will increasingly use recent data produced by others in addition to their own
- We will want robust online environments that make it easier to use shared data both now and in the distant future
- Accurate, complete and standardized metadata is a requirement for a useful data management system. Metadata production and review continues to be labor intensive
- This means we need efficient ways to capture and validate metadata
- Communities are developing tools that minimize the work and are easily grasped and used by PIs and others to produce high-quality metadata

Next Steps

It’s clear the Gulf data management community speaks a common language. The various data systems have similar functional elements and appear to be converging toward the same suite of metadata standards and web services. In the future we want to enable search and retrievals across multiple systems through a single query. Many of the required elements exist to support such interoperability but challenges remain.

Session 002

OIL-DISPERSANTS-SEDIMENT INTERACTIONS AND WEATHERING/DEGRADATION OF SPILLED OIL IN GULF OF MEXICO ECOSYSTEMS

Tuesday, February 17, 2:00p – 5:30p, Galleria IV

Dongye (Don) Zhao, Auburn University*

S. Erin O'Reilly, Bureau of Ocean Energy Management, Gulf of Mexico Region

Joseph Pignatello, Connecticut Agricultural Experiment Station and Yale University

Uta Passow, University of California at Santa Barbara**

Kalliat Valsaraj, Louisiana State University**

Christopher Reddy, Woods Hole Oceanographic Institution**

The interactions of oil and chemically-dispersed oil with sediments and suspended particles in coastal, open-ocean, and deep-water ecosystems affect key physical, chemical and biological processes that control the environmental fate and transport of spilled oil. This session is designed to share the latest research findings on oil-dispersant-sediment interactions, chemical and biological weathering of oil, effects of dispersants on oil degradation and remediation practices and effects of oil dispersants on the environmental fate and transport of spilled oil. The session will serve as a platform for researchers and practitioners to dialog on the latest research implications and applications and to identify future research needs. This session will focus on the following three interconnected topics:

1. Oil-dispersant-sediment interactions and their effects on marine snow formations and on the environmental distribution and transport of spilled oil.
2. Weathering/degradation of oil and effects of oil dispersants.
3. Effects of dispersants on engineered remediation practices.

*Session Organizer

**Invited Speaker

Session Participation

- Approximate number of participants: 250
- Disciplines represented (10 oral presentations)
 - Marine snow formation (physics, bio/chemistry)
 - Chemical and photochemical weathering (photochemistry, analytical chemistry, biochemistry)
 - Novel biochars for oil recovery or containment of oil spills (sorption, remediation)
 - Atmospheric transport of oil and dispersants (atmospheric and interfacial processes)
 - Metal-containing compounds in oil (analytical chemistry)

Session Highlights

- Oil and dispersants enhance formation of marine oil snow by promoting total bacteria number, extracellular polymeric substances and aggregation, marine oil snow can sink and float
- Photodegradation plays more important roles than thought in oil weathering; Corexit 9500A remarkably accelerates photodegradation of PAHs
- Oxygenated hydrocarbons are formed much faster than thought; traditional gas chromatography-mass spectrometry may miss non-gas chromatography-amenable hydrocarbons
- Type and concentration of OxHCs vary significantly for different oil type and oil of different weathering ages
- Dispersants may increase emission of non-volatile oil hydrocarbons; bio-chars may help recover and contain oil spills

Next Steps

- Roles of photodegradation in weathering of oil, especially when combined with other natural weathering processes and when dispersants are present
- Roles of dispersants, oil and microorganisms in formation of MOS, and roles of MOS in oil transport, distribution and transformation
- More reliable analytical methods for quantifying more polar oil compounds that are not GC-amenable
- More accurate oil budget estimate by considering dispersant-facilitated transport and natural weathering
- Effective sorbents for oil recovery and containment
- Correlating oil components with OxHCs

Session 003

MICROBIAL ECOSYSTEM TRAJECTORIES IN GULF OF MEXICO ENVIRONMENTS

Tuesday, February 17, 2:00p – 5:30p, Galleria III

Andreas Teske, University of North Carolina at Chapel Hill*

Joel Kostka, Georgia Institute of Technology

Microbial ecosystems in the northern Gulf of Mexico range from highly productive and seasonally dynamic estuaries, river plumes and nearshore waters to the seafloor, seeps and subsurface sediments of the deep continental slope. These ecosystems react, drastically or subtly, to disturbance over varying time scales and in the context of different environmental parameters. While numerous post-DWH studies have provided taxonomic and metagenomic snapshots and time series surveys of microbial communities and their activities in a wide range of habitats, they have implications for ecosystem function and ecosystem services as well. This session will be coordinated with Session 007 “Making a living on hydrocarbons” and its hydrocarbon-centered microbial theme, to include a broadly defined range of post-DWH microbial ecosystem disturbance events and trajectories across diverse Gulf of Mexico environments.

**Session Organizer*

Session Participation

- 11 presenters and 56 coauthors (excluding duplications) from 16 institutions, representing:
- Microbial physiology
- Microbial molecular systematics & genetics
- Marine and estuarine ecology
- Environmental chemistry and geochemistry
- Sedimentology
- Physical oceanography
- Shipboard operations

Session Highlights

- The DWH impact on microbial community structure and function is superimposed on previously underestimated complex seasonal and spatial dynamics in benthic and planktonic ecosystems
- Microbial baselines, inventories, and thorough accounting for new discoveries are essential to track the full extent of DWH impact and recovery
- Microbial physiology and genomes together unlock the full potential of microbes as omnipresent environmental dipsticks and key agents of post-DWH ecosystem change

Next Steps

- Build on polyphasic microbial diagnostics of DWH impact to parameterize microbial communities and construct network/ metabolic models
- Integrate microbial oil response into ecosystem-scale environmental health diagnostics, oil plume models, and recovery strategies
- Introduce standard operating procedures for genomics and metabolomics to enhance microbial process studies

Session 004

APPLICATIONS OF RESEARCH IN OIL SPILL FATE AND TRANSPORT MODELING FOR DECISION SUPPORT

Tuesday, February 17, 2:00p – 5:30p, Plaza II

Christopher Barker, National Oceanic & Atmospheric Administration*

CJ Beegle-Krause, SINTEF Materials and Chemistry

Louis Thibodeaux, Louisiana State University

Oil spill fate and transport models are integrated computer systems that simulate the transport, fate and effects of oil and chemical spills. Such models are critical to decision support during the response to oil spills, informing planning activities, evaluating trade-offs of response actions, assessing the damage from spills and better understanding the impacts that past and future spills have on the environment. In recent years, much basic research has been done to better understand many of the processes that transport and effect oil spilled in the marine environment, but better understanding of a specific process does not directly translate to better planning for a spill or better response. This session focuses on research aspects that lead us to a next generation of scientifically based fate and transport models designed for decision support.

**Session Organizer*

Session Participation

- Approximate number of participants:
 - 20% -- 30% of room capacity -- didn't count!
- Disciplines
 - Oceanographic Modeling
 - CFD / Plume modeling
 - Decision Support modelers / scientists
 - Decision Makers
 - Decision Communication

Session Highlights

- Model development continues – we have more and better models than ever
- Models and computational techniques are moving to much smaller and richer scales
- Many of the models have matured to the point that it's time for uncertainty analysis
- New analysis techniques have been developed in model sensitivity and uncertainty: within the oil transport model in addition to the environmental fields

How can we use model results?

- Uncertainty estimates provided with results is richer information for decision makers

What does it mean?

- More informed decisions
- Biodegradation information can be made available during some spills
- Our next generation of oil spill scientists will have new tools (e.g. Human Sensor Networks)

Next Steps

- Virtually every aspect of oil spill modeling can be improved on an individual basis, and there is much GOMRI-funded work pursuing those issues. But the key focus of this session is applications for decision support. There is still work to be done in moving newer models of individual processes (plume blowouts, droplet size distributions, bi-degradation, etc...) into models useful for decision support.
- The work in this session on uncertainty analysis demonstrates that the underlying models are mature enough to be useful – but the uncertainty quantification is key to applicability for decision support. That work needs to continue to move forward, and other researchers need to address the uncertainty issues as well.

Session 005

GAPS TO GAINS: TRANSDISCIPLINARY APPROACHES IN EXAMINING ENVIRONMENTAL, HEALTH, AND ECOSYSTEM SERVICES RISK AND RESILIENCE IN GULF COAST COMMUNITIES

Tuesday, February 17, 2:00p – 5:30p, Galleria II

Wednesday, February 18, 8:30a – 12:00p, Galleria II

Maureen Lichtveld, Tulane University School of Public Health and Tropical Medicine*

Claudia Thompson, National Institute of Environmental Health Sciences

David Yoskowitz, Texas A&M University-Corpus Christi

Ashley Ross, Sam Houston State University

Linda Birnbaum, National Institute of Environmental Health Sciences**

Bernard Goldstein, University of Pittsburgh**

The session addressed two conference themes: public health and socio-economics; and education, outreach, and communication. Presentations focused on risk reduction and resilience strategies associated with the reciprocal impact of people and ecosystems. Three modules answered the key questions:

- “What have we learned” featured key research findings to date demonstrating the interconnectedness between public and ecosystem services health;
- “What does it mean” included presentations elucidating the relevance of the research findings to date to our Gulf Coast communities; and
- “How can it be used” focused on research translation and demonstrates the role of evidence-based practical tools in strengthening community health and wellbeing.

From design to dissemination, this session highlighted illustrative examples of community-academic partnerships and transdisciplinary team science applicable beyond disaster-related research.

**Session Organizer*

***Keynote/Capstone Speaker*

Session Highlights

Transdisciplinary health & well-being findings, relevance, use

- Findings:
 - Maternal exposure impacts infant’s DNA telomere length
 - Locally tailored health risk assessment among Vietnamese communities in LA determined seafood safe to eat
 - Loss of resources best predictor of post-traumatic stress disorder in pregnant women
- Relevance:
 - Existing biomarker repositories of ongoing human health studies provide unique opportunities for future research
 - Community based participatory research-driven dissemination of research findings improves risk perception and knowledge of personal exposure
- Use:
 - Longitudinal cohort studies are the gold standard research design to assess cumulative environmental health risks
 - Repository of tools has the potential to accelerate disaster response research

Next Steps

2014/2015 Transdisciplinary Health Research Gaps

CENTRAL CHALLENGE: How to better communicate what is needed in health research to funders

- Invest in Cross-Disciplinary Partnerships- research support to realize partnerships is still lacking
- Assess baseline health status of different communities- inter-disaster research as surrogate remains a critical gap
- Strengthen the science of resilience- promising but limited progress made
- Comprehensively characterize background levels of exposure in communities to better examine changes in health over time-this gap emphasizes the importance of inter-disaster research
- Develop more effective methods to advance environmental health literacy—progress is being made by capacity building programs such the Gulf Region Health Outreach Program and the National Academies of Science Gulf Research program represents a promising opportunity
- Promote the use of locally-collected data to inform the risk assessment decision making process—While the recent Tulane University School of Public Health and Tropical Medicine study in the Vietnamese community in Louisiana is a successful example, much more community-relevant research is needed to put the human health impact of the Gulf of Mexico oil spill in perspective

Session 006

EMERGING ECOLOGICAL IMPACTS OF THE DEEPWATER HORIZON OIL SPILL: EVALUATING ECOSYSTEM CHANGE AND RESILIENCY

Tuesday, February 17, 2:00p – 5:30p, Galleria I
Wednesday, February 18, 8:30a – 12:00p, Galleria I

Steven Murawski, University of South Florida*
Kendra Daly, University of South Florida
Jeff Chanton, Florida State University
William Patterson III, Dauphin Island Sea Lab**

The Deepwater Horizon (DWH) oil spill resulted in thousands of tons of oil entering diverse ecotypes of the Gulf of Mexico. These included the abyssal-benthic, the bathypelagic, continental shelf, near-coastal, and estuarine/salt marsh ecosystems. During the intervening five years, considerable information has been derived documenting the production, species composition and distribution of ecological communities in all of these environments. In some cases, clear trends in population and community dynamics have emerged. In other cases, data show no discernable changes that can be linked with the DWH event. The lack of pre-impact data in some cases have resulted in ecologists either inferring impacts from post-event changes, or essentially substituting “space for time” in comparing ecosystems within the impact zone to pseudo-control areas elsewhere. This session will bring together field ecologists, laboratory researchers and modelers to share information on the interpretation of ecological data sets related to the DWH incident. In particular, the session will focus on understanding ecosystem resiliency (ability of the ecosystem to return following perturbation) in the context of multiple simultaneous stressors.

**Session Organizer*

***Keynote Speaker*

Session Participation

- ~125 participants (22 papers, 34 posters); 8/22 presentations were student projects
- Keynote by Dr. Will Patterson, USA/DISL
- Plankton ecologists
- Ecotoxicologists
- Fishery scientists
- Marsh Insect ecologists
- Ecosystem modelers
- Experimental ecologists
- Oil Spill Responders/Planners

Session Highlights

What have we learned?

- Communities of organisms with high turn-over rates/short life cycles (“r-selected”) or with high migration rates have been able to rebound faster than “K-selected” species / communities (plankton, large pelagic fishes vs. demersal reef fishes)
- Even simple mesocosms/exposure trials show two way effects (e.g., impacts on the organisms and impacts of the organisms on the mesocosm)
- A number of new approaches to biomarkers that index health outcomes and not just exposure

Next Steps

Where do we go next?

- Continuation/initiation of longitudinal (temporal) studies to monitor “return to baselines” and in defining variation and end points for “recovery”
- Comparative ecosystem studies (e.g., southern and northern Gulf) – space for time analogies
- Interpret “black swans” as they emerge
- Better understand multiple simultaneous drivers and the potential for non-linear tipping points
- Design of more representative exposure trials that account for interaction effects
- Calibration of results of exposure and biomarker trials to interpret field data (the “Rosetta Stone” of oil spill effects interpretation)

Session 007

MAKING A LIVING ON HYDROCARBONS: DIVERSITY, METABOLIC POTENTIAL, AND REGULATION OF MICROBIAL HYDROCARBON OXIDATION

Wednesday, February 18, 8:30a – 12:00p, Plaza II

Samantha Joye, University of Georgia*

Olivia Mason, Florida State University

Tony Gutierrez, Heriot-Watt University**

The Northern Gulf of Mexico is a prolific hydrocarbon basin home to over 22,000 natural oil and gas seeps. As a result, the indigenous sediment and pelagic microbial communities are exposed to variable fluxes, concentrations and mixtures of oil and gas over space and time. Following the DWH oil well blowout, numerous reports described the response of the pelagic microbial community to the oil and gas infusion. However, such data at natural seeps is lacking. Though patterns of benthic sulfate reduction and anaerobic methane oxidation have been reported at a few Gulf seep sites, much more remains to be learned about the diversity and metabolic capabilities of microbial communities inhabiting natural seeps. Additional data documenting the patterns and variability in hydrocarbon degradation rates in both the Gulf's sediments and waters are also needed.

*Session Organizer

**Keynote Speaker

Session Participation

- 11 speakers
- Approximately 125 total participants
- Disciplines represented
 - Microbiology
 - Geochemistry
 - Chemical Oceanography
 - Geological Oceanography
 - Biological Oceanography
 - Marine Microbial Ecology
 - Metagenomics and Transcriptomics
 - Oceanographic modelers
 - Organic chemistry

Session Highlights

What have we learned?

- The results presented pointed to a broader ecological niche for hydrocarbon degrading microorganisms than currently recognized. This niche scales from hydrocarbon degrading microbes that live on eukaryotic phytoplankton to free living, uncultured microbial plankton to sediment dwelling microorganisms. The session provided resolution from ecosystem level processes to fine scale data on metabolites produced during microbial hydrocarbon production. Several datasets revealed ecosystem response and resilience that was modulated by the activity of microbial hydrocarbon degraders.

What does it mean?

- It is clear that microorganisms play a large part in ecosystem resilience. Fine-scale resolution of processes mediated by these microbial communities at natural seeps and at blowout-impacted sites is needed to better resolve the ecosystem services microorganisms provided during and after the DWH oil spill.

How do we use it?

- In its entirety this session provided additional knowledge that advances the knowledge of the microbial hydrocarbon degradation capacity that can be used to interpret data generated during the DWH spill, but also to predict how microbial processes influence and impact ecosystem processes should another spill occur.

Next Steps

To better interpret previous findings and predict ecosystem impacts of hydrocarbon inputs, trans-disciplinary science is necessary. For example, research that scales from microbial metabolites, single cells and microbial populations should be paired with geochemical data, ranging from nutrient to hydrocarbon concentrations, and *in situ* rate measurements.

Session 008

AIR-SEA INTERACTIONS AND OIL SPILLS: PROGRESSION FROM SEMI-EMPIRICAL TO PHYSICS-BASED MODELS

Wednesday, February 18, 8:30a – 12:00p, Plaza I

Brian Haus, University of Miami*

Alexander Soloviev, Nova Southeastern University

Joseph Katz, Johns Hopkins University**

Hans Graber, Center for Southeastern Tropical Advanced Remote Sensing - University of Miami**

Lian Shen, University of Minnesota**

Air-sea interaction in the presence of hydrocarbon products is characterized by a variety of physical and biochemical processes. The scales of these processes range from sub-millimeter length scales to atmospheric boundary layer length scales. Oil spills affect aqueous viscous, thermal and diffusion molecular sublayers, modify surface wave spectra and alter surface drift velocities. Remarkably, surface and interfacial tension forces substantially affect oil spill dynamics. Application of dispersants and surfactants dramatically changes the interfacial tension forces, while the oil aging process is a significant factor in oil spill fragmentation and emulsification under the wind/wave action. On somewhat larger scales, turbulence dominates oil transport and may also include spatially-coherent organized motions (Langmuir cells, ramp-like structures, frontal interfaces, etc.). Atmospheric processes, such as storms, squall lines and rain cells, impact oil spills. Thermal stratification and the presence of freshwater plumes in the near-surface layer of the ocean change the surface velocity field and thus conditions for oil spill propagation. Progression from semi-empirical to physics-based models is warranted for the development of improved hydrocarbon transport models. This session will report on new models and parameterizations of air-sea sub grid scale processes. New developments based on theoretical and computational work, field and laboratory experiments and remote sensing will be featured.

*Session Organizer

** Invited Speaker

Session Participation

- 19 talks were submitted, with lead authors from 12 institutions
- Disciplines represented included: Chemistry, physics, fluid mechanics, computational science, atmospheric science, oceanography and microbiology

Session Highlights

What have we learned? Some key results.

Marcello Chamecki: Lincoln experimental satellite showed importance of wave-wind misalignment for transport

Cayla Dean: Diel migration can mix upper ocean if organism density high

Joseph Katz: Thickness of oil layer important for aerosol generation processes, dispersant shifts size distribution to smaller particles

Greg Drozd: Oil important for secondary aerosol generation, new evaporation formulations

Nathan Laxague: Polarimetry can provide unprecedented high-wave number surface wave observations

Bryan Hamilton: Bacillus important bacteria for slicks

Hans Graber: Synthetic aperture radar derived wind sensitive to presence of oil (apparent wind)

Lian Shen: surface waves can effect turbulence in upper ocean

Milan Curcic: Stokes drift important mechanism to include for drift prediction

What does it mean?

- Oil spills affect aqueous viscous, thermal and diffusion molecular sub-layers, modify surface wave spectra and alter surface drift velocities.
- Application of dispersants and surfactants dramatically changes the interfacial tension forces, while the oil aging process is a significant factor in oil spill fragmentation and emulsification under the wind/wave action.

Next Steps

There are many fundamental unresolved questions about the dynamics of air-oil-water interfaces in the ocean environment that require additional research. Among these are:

- The generation functions of both water and oil spray droplets (from aerosols to spume) over a range of wind and wave conditions.
- The role of oil in fresh, weathered, dispersed and emulsified conditions (an all stages in between) in stabilizing the interface to turbulence and wave generation.
- How larger scale processes from Langmuir cells to sub-mesoscales affect near-surface transport.

Fundamental theoretical, laboratory, computational and experimental studies are required to resolve these questions. Being able to better understand and model the fundamental physical processes should lead toward many applications to oil spill transport prediction and response protocols.

The transport of oil at the water surface depends critically on the coupling of the upper water layer in which most of the oil is concentrated with lower layers of the water and with the atmospheric boundary layer above. Improvements in understanding the near surface (0-10 cm) layer should lead to better transport prediction and improved accounting of hydrocarbon fates.

At present most clean up technologies act at the air-oil-water interface, including burning, skimming, booming and surface dispersant application. Improved understanding of the interactions between the three fluid layers and larger scale flows should lead to more efficient and effective response protocols.

Session 009

FATE OF OIL DROPLETS – BREAKUP, TRANSPORT, AGGREGATION AND DEGRADATION OF OIL DROPLETS VIA PHYSICAL, CHEMICAL AND BIOLOGICAL PROCESSES

Wednesday, February 18, 8:30a – 12:00p, Galleria III

Jian Sheng, Texas Tech University*

Kathleen Stebe, University of Pennsylvania**

Joseph Katz, The Johns Hopkins University

In this session, we bring the expertise from biological, chemical and physical science disciplines, to address a series of key processes affecting the fate of crude oil spills, including physical breakup and dispersion of oil patches, aerosolized oil with wind wave interactions, interactions of petroleum with marine organisms and microbes, biodegradation of oil and their potential impacts on public health as well as marine ecosystems. The session will be divided into two main sub-themes:

- Breakup, dispersion, and transport of oil patches; and
- Interactions of microbes, planktons and surfactants at complex oil water interfaces.

**Session Organizer*

***Invited Speaker*

Theme: Understanding key micro-scale processes affecting the fate of crude oil spills

- Breakup & dispersion of oil patches, and transport
 - Breakup of large scale oil patches by currents, breaking waves, and wind
 - Breakup of oil droplets by canonical micro-scale processes
 - Effects of dispersant on physical processes involving in droplet breakup in these settings
 - Physical processes affecting the transport and settling of droplets and the entrainment by bubbles and particles.
 - Aerosolize surface oil by air water interactions, storm, and surface waves
- Interactions of microbes, planktons and surfactants at complex interfaces
 - Active particle mobility and locomotion near an interface
 - Particle adsorption, migration and aggregation at the interface
 - Degradation, consumption, and emulsification
 - Effects of dispersant on microbial activities at interfaces and resulting impact on instability and droplet breakup
- Highlights of Session: Breakup, Transport and Aerosolize
- Understand Macro-scale Processes – plume and droplet generation
 - Effects of dispersant on sub-surface plume: Droplet sizes, mediated by interfacial tension, play a critical role in jet and plume dynamics and structures, i.e. mean penetration depth, and jet expansion
- Micro-scale processes in droplet generation at low surface tension limit
 - New Mechanism – hydrodynamic assisted tip-streaming
 - New Mechanism – Generation of oil aerosols
- Biological processes in drop breakup and aggregates formation
 - Mucus aggregates “entrap” oil droplets
 - Breakup of droplets by zooplankton
- Biofilm over oil droplets
 - Encounter rate of bacteria and drop
 - Biofilm covered oil droplet

Session 010

FATE AND TRANSPORT OF SUBMERGED OIL MATS AND SURFACE RESIDUAL OIL BALLS IN BEACHES AND COASTAL WETLANDS

Wednesday, February 18, 8:30a – 12:00p, Galleria IV

Prabhakar Clement, Auburn University*

John Pardue, Louisiana State University

Michel Boufadel, New Jersey Institute of Technology

The Deepwater Horizon oil spill deposited large amounts of residual emulsified oil in the form submerged residual oil mat (SOMs, which are often called as tar mats) and surface residual oil balls (SRBs, which are often called tar balls), in beach and wetland environments located along the Gulf of Mexico. There is sufficient field evidence that the presence of SOMs and SRBs continue to be a significant concern to local coastal communities. Also, the persistence of a variety of toxic chemicals, such as polycyclic aromatic hydrocarbons, alkylated PAHs and other oxygenated hydrocarbons, in these residues could cause negative effects on shoreline ecosystems. The objective of this session is to invite researchers to present their current understanding of the fate of SOMs and SRBs currently trapped in beach and wetland environments.

**Session Organizer*

Session Participation

- About 60 participants attended session presentations
- Speakers had broad interdisciplinary background
 - Chemists
 - Microbiologists
 - Health scientists
 - Molecular biologists
 - Geochemists
 - Environmental engineers

Session Highlights

- Persistence of tar balls continues to be a problem. Field data collected within the past 12 months from Alabama, Florida and Louisiana beaches were presented to demonstrate this
- Current tar ball activities are well above the background level
- PAHs trapped in tar balls are degrading slowly
- Wide variety of microbes is present in tar balls so there appears to be some potential for faster degradation

Next Steps

- Need better data for understanding background tar ball activity (non-MC-252 tar balls)
- Develop a better understanding of PAH degradation kinetics/pathways in SRBs/tar balls
- Develop better chemical characterization methods
- Field-scale physical and chemical monitoring studies are needed to understand the long-term fate of SRBs/tar balls

Session 011

IMPROVING TOOLS FOR MARINE OIL SPILL RESPONSE: LESSONS LEARNED AND APPLIED

Wednesday, February 18, 1:30p – 5:00p, Galleria II

David Hollander, University of South Florida*

Cortis Cooper, Chevron Energy Technology Corp.

William Lehr, National Oceanic & Atmospheric Administration

Marcia McNutt, AAAS - Science Magazine**

The Deepwater Horizon (DWH) incident taxed the marine oil spill response capabilities of industry and government in ways not anticipated based on the history of marine oil spills. In many cases, decisions to employ particular response techniques were made based on best professional judgment with incomplete information. In the intervening five years since DWH, considerable research, technological development and advances in the operational doctrines of marine spill response have occurred. The deep blowout scenario was complicated by the presence of submerged oil plumes, consumption of oil and gases by microbes in the sub-surface and by the unknown efficacy of the novel use of dispersants injected at the well head, among other issues. Because the spill was initially offshore, understanding the costs and benefits of remediation activities vs. more traditional clean-up activities shore-side is a pivotal concern that is not yet fully resolved. The response “toolbox” for DWH included skimming, booming and burning of oil, use of surface and deep dispersants, mechanical cleanup of beaches and marshes, use of sand berms and physical structures intended to minimize oil entering sensitive shoreside habitats and releases of impounded fresh waters intended to dilute or flush oil back offshore. How successful were these and other response measures and what were their consequences?

**Session Organizer*

*** Keynote Speaker*

Session Participation

- Number of participants – 50
- Audience comprised a diverse group from academia, industry, federal agencies and Coast Guard and those responsible for oil spill response
- Disciplines
 - Physical and biological oceanography
 - Physics
 - Remote sensing
 - Engineering (several specialties)
 - Sociology
 - Organic chemistry

Session Highlights

This session was an eclectic mix of disciplines designed to translate the study results of DWH into practical tools, both physical and virtual, to be better prepared for the next large incident.

Topics ranged from scientific to sociological. As such, the presentations ran the gamut from oil-water separator design to methods to encourage cooperation between agencies and academia.

- What have we learned?
 - Large oil spills are complex events, requiring the creativity of experts from a wide variety of specializations
- Actionable and strategic science, partnerships, new tools, operations
- What does it mean?
 - Oil spill study is an applied subject requiring practical and cooperative research from many disciplines
- Partnerships lead to better, safer, effective and informed decision support
- New cleanup tools and better assessment of oil properties lead to improved situational awareness and preparedness for diverse oil spill response scenarios
- How do we use it?
 - Academics and inventors need to be connected to responders to ensure that good ideas get translated into improved spill response tools

Next Steps

- Improved preparedness for a range of oil spill scenarios
 - Gulf of Mexico vs. Arctic vs. Atlantic Coast
 - New tools for surface water oil collection, coastal and beach remediation
 - Predictive models for a diverse set of environmental conditions are enabled with better assessment of changing oil properties
 - Establish academic-federal agency partnerships for improved rapid response and decision support
- Think outside the box to expect the unexpected

Session 012

TIME SERIES STUDIES OF CHEMICAL TRANSFORMATIONS, FLUXES AND TRACERS ASSOCIATED WITH ACCIDENTAL AND NATURAL OIL AND GAS RELEASES

Wednesday, February 18, 1:30p – 5:00p, Plaza I

Laura Lapham, University of Maryland Center for Environmental Science*

Christopher Martens, University of North Carolina at Chapel Hill

During the Deepwater Horizon petroleum blowout event, chemical and physical partitioning of enormous volumes of natural gas, aqueous soluble and insoluble oil components, dispersants and oil-flocculent materials led to the formation of large sub-surface hydrocarbon intrusions, widespread occurrence of surface oil slicks and sheens and coastal and offshore oiled-sediment accumulations. What are the temporal and spatial scales of the impacts of sub-surface oil and gas intrusions and the sinking of aggregated flocculent oil-rich particles to the sediment and oil accumulation in shallow and deep sediments? What is the fate of new carbon derived from the blowout? What has been learned so far from post-blowout time series studies? How do hydrocarbon fluxes and transformations from the blowout compare with natural oil and gas seep releases? What records do sediment cores hold in terms of baseline environmental conditions that existed prior to oil drilling and quantitative spatial and temporal changes resulting from the blowout and the eventual recovery? This session will address several of the conference themes, including understanding dynamic chemical and physical processes in the Gulf of Mexico, understanding the chemistry and evolution and interactions of pollutants introduced by humans in open-ocean and deep-water ecosystems.

**Session Organizer*

Session Participation

- ~75 attendees in the session
- Disciplines represented:
 - Chemistry
 - Geochemistry
 - Biogeochemistry

Session Highlights

What have we learned?

- We need long term, time-series records to discern trends in the Gulf because environmental data is noisy
- Much remains to be learned about the depositional sites and degradation of DWH-derived hydrocarbons in Gulf waters and sediments, salt marshes and beaches
- Progress has been made in determining source strengths and transport rates of gas and oil in the northern Gulf derived from natural versus accidental release sources
- Much has been learned about mechanisms of processes controlling the fate and distribution of petrocarbon in the water column and sediments of the deep northern Gulf
- Oil is transformed in a variety of ways into weathered products that do not bare the same signature as Macondo oil
- Biogeochemical cycling of nutrients and many other elements can be closely related to hydrocarbon releases

This was our second time series session from 2013 to now. Scientists are using this new information to expand the scope of their research as a result of what they have learned at these sessions

Individual projects are producing valuable time series data that will be critical for developing coherent predictive models

What does it mean?

- We are better prepared to monitor and predict the fate of both natural and accidental releases of hydrocarbons in the northern Gulf and elsewhere than we were in 2010
- Recent developments of technology and experimental approaches have improved capabilities to follow the transformation and flux of oil-derived carbon

How do we use it?

- Time-series data have improved our capabilities to create predictive models used to follow transformations and fluxes of hydrocarbons

Next Steps

- Quantification of the mechanisms and rates of processes now thought to control temporal and spatial variations in the transformations and fluxes of hydrocarbons in the Gulf should produce data needed to facilitate the development of vastly improved models for predicting the fate of hydrocarbons from natural sources and accidental releases

Session 013

DISPERSANTS AND THEIR COMPONENTS: ENVIRONMENTAL FATE AND EFFECTS ON ORGANISMS AND BIOGEOCHEMICAL PROCESSES

Wednesday, February 18, 1:30p – 5:00p, Plaza II

Anne McElroy, Stony Brook University*

P. Lee Ferguson, Duke University**

Bruce Brownawell, Stony Brook University**

Olanike Adeyemo, University of Florida***

Matt Perkins, Oregon State University***

Environmental trade-offs related to the use of dispersants to mitigate some of the effects of oil spills, and past and future dispersant use remains a subject of controversy. This session will bring together researchers from different disciplines who have been making progress on understanding the composition and environmental distributions of complex mixtures of dispersant components; biogeochemical processes that can fractionate or transform chemicals in dispersant formulations; effects that dispersants can have on the fate of nonaqueous oil phases and dissolved petroleum hydrocarbons, including interactions with suspended particles or bed sediments; and effects of dispersants and specific ingredients alone or in chemically dispersed oil have on biota and ecosystem health and function. To better synthesize what has been learned about the likely or potential impacts and fate of dispersant mixtures, and as a guide to identify knowledge gaps, it will be important to consider how concentration and composition influence mechanisms of response and environmental fate.

*Session Organizer

** Session Co-Chair

*** Invited Speaker

Session Participation

- Session 13 consisted of 9 oral presentations, a panel discussion with invited experts not already presenting in this session, and 14 posters. Students or postdocs presented more than half the talks and many of the posters. The session was attended by >70 participants.
- Disciplines represented:
 - Aquatic toxicology
 - Molecular toxicology
 - Environmental chemistry

Session Highlights

Our goal in this session was to bring together investigators examining both the fate and effects of dispersants and dispersed oil in marine ecosystems. Specifically we were interested in how composition and concentration influence both toxicity and environmental fate. A panel of experts was brought together to end the session in an attempt to summarize state of the knowledge and identify important unanswered questions to guide future research in this area.

Effects concentrations

- Acute and chronic sublethal (e.g., molecular, immunological, reproduction, developmental) and sometimes even lethal effects of Corexits and chemically enhanced water accommodated fractions (CEWAFs), sometimes in the sub-ppm range, have been observed. Early life stages are generally more sensitive; some species are extremely sensitive. Effects at sub ppm concentrations have ecological

importance as they approach the highest levels measured in the surface and deep water plume. The importance of interpreting effects data in terms of environmental concentrations in evaluating risk was highlighted in the panel discussion.

- Improvements in the use of gene expression and mRNA regulation approaches for examining effects were presented. Such approaches offer insight on cellular pathways of response and impairment. Linking such effects to responses at higher levels of organization is needed.
- The influence of physical factors (oxygen, temperature, salinity) on effects was also demonstrated. These may help identify specific habitats and sensitive communities at greater risk.
- Evidence was presented which supports the hypothesis that the enhanced toxicity of CEWAFs (as compared to WAFs or water soluble oil fractions) to animals can be explained by greater dissolved levels of hydrocarbons such that synergistic or additive effects of Corexit components do not need to be invoked with at least some toxicity endpoints. Such studies are important, because an increasing number of toxicity experiments have argued otherwise. The role of dispersants with respect to toxicity of dispersed oils is complicated by uncertainties related to speciation of potentially toxic components in solution and general lack of markers of toxicity that can be related specifically to increased risk due to the presence of dispersants in the environment.
- As a group, the invited panel focused their comments on the need to put the environmental and ecological effects of dispersants in the context of what are much larger long term effects of oil spills, especially when they reach sensitive coastlines.

Chemical Characterization

- The persistence of Dioctyl Sodium Sulfosuccinate in sediment was reported, although at very low ppb ranges and patchy distributions; however, levels as high as 9 ppm have recently been reported in oil affected deepwater sediments. Sediment trap concentrations were not dramatically different than sediment levels, further enforcing the uncertainty related to mechanisms of delivery of DOSS to sediments and why it is preserved in some cases. These results inform possible exposures to the benthos. Studies of DOSS sorption to suspended solids are leading to improved predictions that can now help constrain some of these questions. Sorption studies will also inform possible exposures to the benthos.
- Several talks illustrated significant advances in the detailed characterization of Corexit formulations. The power of improved high resolution mass analysis was shown, as well as the complexities that remain in regard to some of the surfactants found in Corexit. These approaches are already being applied to understand rates and pathways of degradation/loss in laboratory studies, but in the case of Tween and SPAN surfactant residues, improvements in method detection limits would be needed to assess these complex mixtures in the field. Detailed characterization work would be especially useful in microbial community effects studies because of differences in the lability of different substrates.
- The production and relative persistence of hydrolysis and de-ethoxylation products of otherwise labile nonionic Tween and Span surfactants has been noted. While toxicity to metazoans has not been established for these products, they could lead to prolonged exposure of Corexit derived substrates to microbial communities.
- Estimates on Corexit composition presented were not widely different than the range that has been reported in the literature. However, the reported range of compositions raises some questions about how variable are the proportions of different ingredients. These variations may derive from differences in analytical methods or batch to batch variability. Not only does knowledge of the composition of dispersants inform possible risks and fate associated with use, but if there are pronounced differences in Corexit component compositions, this can be important for interpreting some possible applications of components such as DOSS and dipropylene glycol butyl ether as tracers of water masses or fate of dispersant oil mixtures.

Next Steps

New results on effects of Corexit on selected animals at lower and more environmentally relevant concentration highlight a continued need to better understand the toxicity of Corexit and other dispersants alone. There are only a couple of published studies that have demonstrated effects to plants or animals at sub-ppm levels that are either expected following applications, or were detected in measurement programs conducted during and after the DWH spill. When work, such as that presented by NOAA at this meeting, is published, there should be synthesis of what has been learned about most sensitive species or communities (including microbial populations) targeted at prioritizing research questions aimed at identifying species or communities that may be most at risk, and mechanisms of those effects. Such prioritization would benefit from consideration of what is known about exposure pathways and the concentrations and durations of exposure that might be encountered in different spill response scenarios.

Assessing risks of dispersant applications would benefit from further study of the combined effects of oil and dispersants, but should focus on determining pathways/mechanisms for combined effects. More effort is needed to account for exposure to dissolved concentrations of both hydrocarbons and dispersant species in the presence of droplets. Such studies should also consider the evolution of chemical concentrations and composition of oil dispersant mixtures in the laboratory and field.

The composition of potentially toxic components of dispersants and their degradation products change rapidly in the field and in laboratory cultures, although some results suggest that components more toxic to animals are more persistent. There is a need for better chemical characterization of dispersant mixtures under field and lab conditions that can be tied to mechanisms of metazoan toxic response and particularly with respect to microbial community and function.

In addition to effects on fate of oil, perhaps the biggest effects of dispersants will be related to interactions of microbial populations with Corexit residues. Such effects that have been seen might be further examined within the context of dispersant mixture effects evolving rapidly in time and space in the water column as a result in differences in oil partitioning and degradation.

Additional work is needed to assess the mechanisms by which DOSS, and presumably other Corexit components reach benthic environments and the factors that control their observed persistence in sediments that has been established now by two groups.

There is value in intercalibration between laboratories associated with estimates of Corexit compositions, at least for more easily determined and persistent components. It would also be of great value to determine differences between different batches and the effects of storage times and compositions.

As GOMRI's activities progress, careful consideration should be given to a range of possible approaches for synthesizing existing information (data review, conceptual models, and modeling) to inform risk assessments and future research needs.

Session 014

IMPACTS FROM THE DEEPWATER HORIZON SPILL ON DEEP-SEA ECOSYSTEMS: DETECTION, CAUSES, AND EFFECTS ON THE BENTHOS

Wednesday, February 18, 1:30p – 5:00p, Galleria IV
Thursday, February 19, 8:30a – 12:00p, Galleria IV

Amy Baco-Taylor, Florida State University*
Charles Fisher, Pennsylvania State University***
Amanda Demopoulos, US Geological Survey
Helen White, Haverford College
Carl Kaiser, Woods Hole Oceanographic Institution
Paul Montagna, Texas A&M University-Corpus Christi**

The Deepwater Horizon (DWH) oil spill provides a first opportunity to understand the effects of an oil spill on deep-sea fauna. Deep-sea benthic fauna (including microbes, meiofauna, macrofauna and megafauna) are diverse, ubiquitous and interlinked, and perform important ecosystem services including bioturbation and carbon cycling, as well as being components of the food web for demersal fisheries species. In addition, many benthic taxa are highly sensitive to perturbations and thus represent good indicators of the spatial and temporal extent of the spill impact on the deep-sea floor. Oil, gas and dispersants originating from the DWH spill were transported to deep-sea ecosystems through neutrally buoyant deep-water plumes and via marine snow containing oil from surface slicks that subsequently sank. The persistence of the DWH oil and associated dispersants as well as the spatial extent and severity of the impacts of the spill, have been influenced by chemical, physical and microbial processes. Impacts to both hard-ground and soft sediment ecosystems in the deep Gulf of Mexico have been documented and studies are ongoing. In addition, the persistence of the DWH oil and dispersants as well as the response of microbes and other fauna to these compounds, are the subject of intense study. In this session, we invite papers that investigate the full range of effects of the spill on deep-sea ecosystems, from microbes to megafauna, from organisms to ecosystems and from acute to chronic as well as papers describing new methods developed to survey, recognize and study anthropogenic impacts to deep-sea ecosystems.

*Session Organizer

** Invited Speaker

Session Participation

- 30 Presentations
 - 22 oral (8 graduate students)
 - 8 posters (6 graduate students)
- 150-200 in audience at all times
- Disciplines represented
 - Biological
- Areas: Ecology, Ecotoxicology, Genomics, Physiology, Reproduction
- Communities: Hard ground, Soft bottom communities, Pelagic
- Taxa: Microbes, Meiofauna, Macrofauna, Megafauna, Fish
 - Biogeochemical
 - Biogeostatigraphy
 - Marine Archeology
 - Oceanography
 - Technology

Session Highlights

What have we learned?

- There was rapid sedimentation of oil containing “snow” and it is moving around
- Impacts on all infaunal groups (protozoa, meiofauna, and macrofauna) and have persisted for at least one year; five years for macrofauna in one study
- Benthic communities near seeps are different from those near the wellhead
- No apparent impacts in shallower, < 100m, shelf areas
- Impacts on corals widespread and persistent, commensals can mitigate effects
- Impacts to fish species

What does it mean?

- Benthic-pelagic coupling means there are impacts to all bottom habitats and trophic levels
- The impacts are wide-spread
- The impacts are persisting
- New impacts are still being discovered
- A lot of new basic biology and ecology of deep-sea organisms is being discovered

How do we use it?

- Identify restoration needs
- Fill in data gaps, planning monitoring
- Predicting impacts from future spills

Next Steps

- Need to understand temporal dynamics
 - Is oil still moving? Where?
 - Are communities resilient? How long will recovery take?
 - What are long-term implications of sublethal effects?
- Need more spatial resolution of baselines and impacts

Session 015

COASTAL ECOSYSTEMS FOUR YEARS AFTER THE DWH OIL SPILL: WHAT'S CHANGED?

Wednesday, February 18, 1:30p – 5:00p, Galleria I

Thursday, February 19, 8:30a – 12:00p, Galleria I

R. Eugene Turner, Louisiana State University*

Nancy Rabalais, Louisiana Universities Marine Consortium

Brian Roberts, Louisiana Universities Marine Consortium

Scott Zengel, Atkins, Incorporated**

This session invited contributions on how coastal ecosystems have been affected, or not, following 4+ years of oil exposure from the Deepwater Horizon spill. We invited talks on the responses for a wide range of topics including oil distributions and degradation in the marshes and nearshore sediments, trajectories of oil transport, marsh erosion and stability, marsh vegetation, food web studies, and specific community responses (e.g., insects, infauna, birds, fish, etc.), commercial fisheries and ecological and biogeochemical process rates.

The session engaged three main questions:

1. What are the impacts that are significant, long-lasting and incompletely revealed?
2. What would we do differently as scientists - or urge others to do differently -- to optimize the preparation for and response to future spills?
3. How does what we have learned influence how management might or should respond to future oil spills and their prevention?

*Session Organizer

** Invited Speaker

Session Participation

- Approximate number of participants = 50 co-authors, 90 to 150 attendees
- aerial imagery, benthos, biogeochemistry, chemistry, ecology, modeling, restoration ecology, fish ecology, microbial ecology, natural history, ornithology, phytoplankton, rhodoliths, seaweeds

Session Highlights

What have we learned?

- Oil distribution in coastal environments was not homogeneous in time and space
- There were multiple oiling events spanning several years, of varying oil quality, and with multi-year effects (expect more)
- Environmental assessments began with sparse baseline observations to evaluate impacts
- The environmental reactions to oiling involve complex interactions of multiple stressors, interactive synergist stressors, with possible lag effects
- Erosion is forever

What does it mean?

- Multi-year observations are necessary
- Cooperative multi-disciplinary teams are required
- Prevention is invaluable

How do we use it?

- The uncertainties are large – expect surprises
- Environmental assessments require >3 years
- A regional knowledge base is very important

Next Steps

- Continued hypothesis testing with field data, models, and manipulative experiments
- Long-term measurements of key parameters to develop environmental baselines
- Put the presumed or validated oil impacts within the context of multiple stressors occurring in diverse geomorphological settings
- Continued monitoring of oil quantity and quality
- Exploit ‘perturbations of opportunities’ to test validity of various indices of resilience
- Publication, communication, data sequestration, education, public outreach

Session 016

DYNAMIC PHYSICAL PROCESSES IN THE GULF OF MEXICO: WHAT HAVE WE LEARNED, WHAT DOES IT MEAN AND HOW CAN IT BE USED?

Wednesday, February 18, 1:30p – 5:00p, Galleria III
Thursday, February 19, 8:30a – 12:00p, Galleria III

Clint Dawson, University of Texas at Austin*

Eric Chassignet, Florida State University

Tamay Özgökmen, University of Miami

Tim Nedwed, ExxonMobil Upstream Research Company**

Cortis Cooper, Chevron Energy Technology Corporation**

This session will focus on dynamic physical processes in the Gulf of Mexico, what has been learned about these processes through recently funded research, and, in turn, how this research has improved understanding of transport (e.g. chemical and biological) across vastly different scales. Presentation topics will include in-situ observations and experiments on physical processes occurring at various scales, laboratory studies, geophysical modeling and the development of numerical simulation tools. This session will provide a forum for dialog on research implications, applications and synthesis, with participation from university, government and industry researchers.

**Session Organizer*

***Invited Speaker*

Session Participation

- ~100 attendees
- Invited Talk: Effectiveness of subsea dispersants (Tim Nedwed)

Topics:

- Physical oceanography of the Gulf
- Coupled atmosphere-ocean modeling
- Circulation/transport during hurricanes
- Description and analysis of field experiments: GLAD, SCOPE and deep tracer
- Experimental design
- Satellite observations and impact on modeling
- Processes at depth, bottom effects
- Turbulence effects on oil droplets
- Freshwater inflows into Gulf
- LES models and model bootstrapping

Session Highlights

What have we learned?

- Dynamic physical processes in the Gulf are complex, multi-scale, depth dependent, seasonally dependent
- GoMRI research has led to vast improvements in experimental design, modeling, quantity and quality of data over past 3 years
- American Petroleum Institute funded research shows effectiveness of subsea dispersants

What does it mean?

- Better understanding of transport (advective pathways, dispersion,...) in the Gulf, still many unanswered questions. Many implications for design of experiments, instrumentation and measurements, and modeling

How do we use it?

- Improve design of experiments
- Where/how to focus modeling efforts
- Data for validation/comparison of models
- Improve blending of data and models
- Research spin-offs
- Education and outreach
- Ultimate goal is better response to oil spills in real-time

Next Steps

- Propose a joint API/GoMRI Workshop on Oil Spill Response (suggested by Tim Nedwed, head of API Subsea Dispersant Injection Program)
- LASER experiment (winter 2016)

Session 017

HIGH-PRESSURE EXPERIMENTAL AND MODELING-BASED STUDIES FOR UNDERSTANDING DEEP BLOWOUT

Thursday, February 19, 8:30a – 12:00p, Plaza I

Claire Paris, Rosenstiel School of Marine and Atmospheric Science*

Zachary Aman, The University of Western Australia

Michael Schlüter, Hamburg University of Technology

Carolyn Koh, Center for Hydrate Research at the Colorado School of Mines**

Karen Malone, Hamburg University of Technology+

Katrin Laqua, Hamburg University of Technology+

The goals of the session were to understand the behavior of live oil, gas and chemical dispersants in deep water environments and to quantify the fate processes of both oil and gas in the water column that enable predictive capacity of their vertical and lateral migration. These outputs can be applied to predict the severity of future marine blowouts and quantify the effectiveness of deep dispersant injection. The major underlying hypothesis was that the physical and chemical process associated with high pressure and water stratification result in deep plumes with intrusion layers identified in field data at several depth intervals and the formation of hydrates for which the effects of dispersants is unclear. Even less clear are the interactions of dispersant with oil fate processes, including biodegradation, dissolution, flocculation, sedimentation and sequestration in the deep sea.

This session focused on experimental, multi-physics Computational Fluid Dynamics (CFD), and multi-phase hydrocarbon modeling-based studies that are necessary to predict the distribution of crude oil under high pressure and cold water conditions, and to enhance the accuracy and applicability of far-field simulators in these extreme conditions.

**Session Organizer*

*** Keynote Speaker*

+Invited Speaker

A summary for this session is not available.

Session 018

FRONTIERS IN DISPERSANT SCIENCE AND TECHNOLOGY: FROM MOLECULAR MECHANISMS TO DESIGN OF NOVEL DISPERSANTS AND FIELD APPLICATIONS

Thursday, February 19, 8:30a – 12:00p, Plaza II

Berrin Tansel, Florida International University*

Norma Alcantar, University of South Florida

Ronald Larson, University of Michigan

Tim Nedwed, ExxonMobil**

This session was sponsored by the Consortium for the Molecular Engineering of Dispersant Systems (C-MEDS). The session will focus on the new advances in dispersant science and technology and translation from fundamental physiochemical science to the integrative analysis of dispersant fate and ecosystem impacts. A distinctive aspect of the session is the integration of scales from molecular concepts to large scale dispersant application in the open ocean environment. The session will provide a forum for disseminating cutting edge research from nanoscale analyses to large scale dispersant dynamics and long term fate of dispersants. The session will include presentations on topics such as the next generation of dispersants, novel methods of delivery, assessment of performance, toxicity and fate. A white paper will be produced to disseminate the scope of research topics presented in the session.

*Session Organizer

** Invited Speaker

Session Participation

- Approximate number of participants : 50-70
- Bullet list of disciplines represented
 - Chemical engineering
 - Environmental engineering
 - Mechanical engineering
 - Biochemical engineering
 - Biomolecular engineering
 - Environmental toxicology
 - Physics
 - Molecular science
 - Chemistry
 - Material science
 - Water resources
 - Earth science

Session Highlights

What have we learned?

- Zwitterionic microgel (ZI-MG) particles exhibit both thermo-sensitivity and pH-responsiveness
- Modified phosphatidylinositol (PI) are biodegradable and speed up bacterial activity
- Oil can be forced into discrete droplets and stabilized by carbon black nanoparticles
- Oil matter and surfactants (DOSS, Tween 80, Tween 85, Span 80) can be adsorbed on of bubble film and transported into the atmosphere
- Sequential addition of surfactants can control interfacial coverage and minimize bulk interactions

- Nanoparticles prepared using biocompatible materials offer potential to be the next generation of dispersants
- Grafted nanoparticles act as unimolecular micelles exhibiting the ability to encapsulate hydrocarbons without a critical micelle concentration (CMC)
- Breaking waves are a potential contributor in the fate and transport of petroleum hydrocarbons to the atmosphere
- Irreversible-reversible adsorption transition of dispersants can be predicted from thermodynamic data

What does it mean?

- Research activities at the molecular and nanoscale provide better understanding of the effectiveness of novel dispersants in view of their physical and chemical characteristics
- Novel dispersants can be effective in controlling the transport of spilled oils. Biocompatible dispersant can enhance the degradation of oil
- Modified phosphatidylinositol (PI) are biodegradable and speed up bacterial activity
- Grafted nanoparticles can be used to encapsulate hydrocarbons without a critical micelle concentration (CMC)
- Persistence of the dispersants and oil can be controlled by functionalized nanoparticles and biomaterials
- There are still significant knowledge and technology gaps for translating novel dispersant formulations to field

How do we use it?

- Research at the molecular and nanoscale can be translated to field. More effective dispersants can be manufactured based on better understanding on their compatibility with oil fractions
- Dispersant can be transported with bubbles into the atmosphere. Dispersant effectiveness can be limited due to losses by adsorption. Effective dispersant application methods and equipment are needed to minimize dispersant loss
- Theoretical and experimental studies indicate that a decision system can be implemented for improving the oil spill response and management of dispersant application process

Next Steps

- There is a pressing need for alternative, cheaper and environmentally-benign dispersants for oil spill response and remediation
- Novel, biocompatible, and functionalized nanoparticles have the potential to be the next generation of dispersants
- Research needed on compatibility studies of new dispersants with different oils and environments
- How can we apply the knowledge from laboratory to field? Equipment, application methods, mass production issue still remain to be explored
- What factors would be limiting the scale up of new molecular and nanoparticle formulations?
- How can we mass produce and how can we apply?
- How can we improve the equipment and technology for more effective dispersant applications?
- What are the training needs for the new technologies?

Session 019

PREDICTING THE OCEAN ENVIRONMENT

Thursday, February 19, 8:30a – 12:00p, Galleria II

Scott Smith, Naval Research Laboratory*

Matthew Carrier, Naval Research Laboratory

Hans Ngodock, Naval Research Laboratory

Bruce Cornuelle, Scripps Institution of Oceanography**

This session will focus on predicting the ocean environment in the Gulf of Mexico using data assimilation in conjunction with numerical modeling. A vast amount of data was collected in the Gulf of Mexico during the aftermath of the Deepwater Horizon Oil Spill and much of that data was assimilated with various types of models to improve model accuracy; specifically as it relates to the prediction of mesoscale properties, currents and other ocean variables. This session seeks to demonstrate the application of these rich datasets to improve modeling and forecasting efforts in the fields of physical, biological or chemical oceanography.

**Session Organizer*

*** Invited Speaker*

Session Participation

- Approximate number of participants: 50
- Bullet list of disciplines represented (approximate): data assimilation, ocean modeling, coupled modeling, covariance modeling, observation impact, and statistics.

Session Highlights

This session focused on the observations, data assimilation, and numerical modeling tools and methods that can be used to improve the prediction of the ocean environment in the Gulf of Mexico.

Data Assimilation

- The inclusion of drifter observations in an assimilation system can significantly improve predictability of velocity flow fields, Lagrangian trajectories, and mesoscale features.
- Velocity data can be challenging to assimilate due to its temporal variability and the need for proper dynamical balance constraints.
- The inclusion of Sea Surface Height (SSH) observations can improve the predictability of the mesoscale fields, sub-surface T/S, as well as the 3D flow field.
- Directly assimilating SSH data can be challenging due to gravity waves and the need for a long-term mean SSH.
- Glider data can improve the predictability of the sub-surface ocean state.

Observation Use and Model Set-up

- Assimilation parameters, such as covariances, assimilation time window, and data insertion have a significant impact on predictability.
- Coupling ocean, atmospheric and wave models can improve the forecast of the mixed layer depth.
- Observation simulation system experiments and/or adjoint sensitivities can be used to determine optimal observation deployment strategies.
- The extreme value theory can be used for oil spill risk assessment, contingency planning, and environmental impact.
- Model parametrization of turbulence and particle size can significantly impact the horizontal transport of particles.

Next Steps

- The following are some of the future efforts that were discussed in this session in how to further improve the predictability of the ocean environment:
- Increase model resolution
- Expand the complexity of coupled modeling/assimilation systems
- Extract more information from existing observations via more sophisticated measurement functionals and data assimilation methodologies
- Implement more/smarter/cheaper observation networks

APPENDIX 1: CONFERENCE OVERVIEW SCHEDULES

Overview Schedule Monday, February 16, 2015

12:00pm-6:00pm	Registration & Check-in Open
	Exhibit Set Up
1:00pm-5:00pm	Speaker Ready Room Open
1:00pm-6:00pm	Poster Hang-Up
Associated Meetings & Events	
9:00am-6:00pm	Monitoring Status and Trends of Long-Lived Marine Vertebrates as a Measurable Indicator of Restoration and Long-Term Health of the Gulf of Mexico Ecosystem
12:30pm-5:30pm	COMPASS Student Half-Day Workshop: Communicating Your Science
1:00pm-6:00pm	Near Field Modeling Workshop
1:00pm-5:00pm	Hydrocarbon Analysis Experiment: An Important Step in QAQC
1:00pm-2:30pm	State-of-Science on Dispersants and Dispersed Oil
2:00pm-5:00pm	Genomics and Metagenomics: Environmental Applications in Oil Spill Response and Recovery
3:00pm-4:30pm	Environmental Disasters Data Management

Overview Schedule Tuesday, February 17, 2015

7:30am-6:00pm	Registration & Check-in Open
8:00am-6:00pm	Exhibits Open
	Speaker Ready Room Open
8:00am-8:00pm	Poster Hall Open
Opening Plenary Program Schedule	
Starting at 7:30am	BREAKFAST
8:30am-10:15am	Welcome and Introduction <i>Dr. Rita Colwell, Gulf of Mexico Research Initiative Research Board</i>
	Keynote Address <i>Dr. Richard Spinrad, National Oceanic and Atmospheric Administration</i>
	Reports from Consortia funded by Gulf of Mexico Research Initiative (GoMRI)
10:15am-10:40am	BREAK
10:40am-12:30pm	GoMRI Consortia Reports continued
12:30pm-2:00pm	LUNCH
Scientific Program Schedule	
2:00pm-5:30pm	Session 001 – 006
3:30pm-4:00pm	BREAK
5:30pm-8:00pm	Poster Session (featuring Sessions 001 – 009) & Reception
Associated Meetings & Events	
10:15am-10:40am	GRIIDC Session 1
12:30pm-2:00pm	COMPASS Lunchtime Workshop: Communicating Your Science
3:30pm-4:00pm	GRIIDC Session 2

Overview Schedule Wednesday, February 18, 2015

8:00am-6:00pm	Registration & Check-in Open
	Exhibits Open
	Speaker Ready Room Open
8:00am-8:00pm	Poster Hall Open
Scientific Program Schedule	
Starting at 7:30am	BREAKFAST
8:30am-12:00pm	Session 005 – 010
10:00am-10:30am	BREAK
12:00pm-1:30pm	LUNCH
1:30pm-5:00pm	Session 011 – 016
3:00pm-3:30pm	BREAK
5:30pm-8:00pm	Poster Session (featuring Sessions 010 - 019) & Reception
Associated Meetings & Events	
8:00am, 10:00am, & 3:00pm	GRIIDC Sessions
12:00pm-1:30pm	COMPASS Lunchtime Workshop
5:15pm-6:45pm	Gulf Science and Restoration Programs Update & Panel Discussion
7:00pm-8:00pm	Science Partnerships Enabling Rapid Response (SPERR)

Overview Schedule Thursday, February 19, 2015

8:00am-12:00pm	Registration & Check-in Open
8:00am-3:30pm	Exhibits Open
8:00am-12:00pm	Poster Hall Open
Scientific Program Schedule	
Starting at 7:30am	BREAKFAST
8:30am-12:00pm	Session 014 – 019
10:00am-10:30am	BREAK
12:00pm-1:30pm	LUNCH
Plenary Program Schedule	
1:30pm-3:30pm	Presentation of Student Awards <i>Sherri Goodman, Consortium for Ocean Leadership</i> Session Summaries and Discussion <i>Moderated by Dr. Margaret Leinen, Scripps Institution of Oceanography</i> Conference Wrap-Up
Associated Meetings & Events	
10:00am-10:30am	GRIIDC Session 3

APPENDIX 2: GOMRI-FUNDED CONSORTIA

Consortium for Advanced Research on Transport of Hydrocarbon in the Environment (CARTHE)

<http://carthe.org/>

Presented by Tamay M. Özgökmen, PhD

CARTHE is a research team dedicated to predicting the fate of oil released into our environment to help inform and guide response teams, thereby protecting and minimizing damage to human health, the economy, and the environment.

Center for Integrated Modeling and Analysis of Gulf Ecosystems (C-IMAGE)

<http://www.marine.usf.edu/c-image/>

Presented by Steve Murawski, PhD

The C-IMAGE Consortium is a comprehensive research team from 13 national and international universities to address Themes 2 and 3 of the Gulf of Mexico Research Initiative (GoMRI). These themes cannot be studied in isolation, as the physical, chemical and biological processes determine the potential for effects on elements of the ecosystem. We study their space/time/trophic level connections using a hierarchy of calibrated models, supported by observations, sampling and high-pressure experimental studies where necessary, with a focus on the eastern Gulf of Mexico. The primary objectives of C-IMAGE are:

- to improve the observational and predictive tools available
- to better understand the DWH event in hindsight
- to predict the consequences of another deep-sea blow out in the Gulf of Mexico (GOM) or elsewhere

Consortium for Molecular Engineering of Dispersant Systems (C-MEDS)

<http://dispersant.tulane.edu/>

Presented by Vijay John, PhD

The Consortium for the Molecular Engineering of Dispersant Systems (C-MEDS) is a research collaboratory involving 43 investigators from 22 universities in the US. The Consortium is based on the premise that dispersants are an essential aspect in the effective management and mitigation of large oil releases from deep ocean environments. The Consortium has an Advisory Committee with distinguished scientists from Industry and the Federal Laboratories. In addition to its research mission, the Consortium has a strong education mission to train students in advanced science and technology related to the mitigation of oil spills, and an outreach mission to communicate and provide information on the role of dispersants in oil spills.

Coastal Waters Consortium (CWC)

<http://cwc.lumcon.edu/>

Presented by Nancy Rabalais, PhD

The Coastal Waters Consortium (CWC) came together in early 2012 to assess the chemical evolution, biological degradation, and environmental stresses of petroleum and dispersant within Gulf of Mexico coastal and shelf ecosystems.

Deep Sea to Coast Connectivity in the Eastern Gulf of Mexico Consortium (DEEP-C)

<http://deep-c.org/>

Presented by Eric Chassignet, PhD

The Deep-C (Deep Sea to Coast Connectivity in the Eastern Gulf of Mexico) Consortium is a long-term, interdisciplinary study of deep sea to coast connectivity in the northeastern Gulf of Mexico. The study is investigating the environmental consequences of petroleum hydrocarbon release in the deep Gulf on living marine resources and ecosystem health. Deep-C will examine the geomorphologic, hydrologic, and biogeochemical settings that influence the distribution and fate of the oil and dispersants released during the DWH accident, and use the resulting data for model studies that support improved responses to possible future incidents.

Dispersion Research on Oil: Physics and Plankton Studies Consortium (DROPPS)

<http://dropps.utmsi.utexas.edu/>

Presented by Edward Buskey, PhD

The DROPPS Consortium is a team of scientists studying the effects of oil spills in the Gulf of Mexico. DROPPS researchers are examining the breakup of oil as well as the interactions of different planktonic and microbial species with oil. The information gathered from this research helps to predict the overall impact of oil spills, allowing for better protection of people and the environment.

Ecosystem Impacts of Oil & Gas Inputs to the Gulf Consortium (ECOGIG)

<http://ecogig.org/>

Presented by Geoff Wheat, PhD, and Samantha Joye, PhD

ECOGIG's mission is to understand the environmental signatures and impacts of natural seepage versus that of abrupt, large hydrocarbon inputs on coupled benthic-pelagic processes in deepwater ecosystems in the Gulf of Mexico, and to chart the long-term effects and mechanisms of ecosystem recovery from the 2010 Macondo well blowout.

Gulf of Mexico Integrated Spill Response Consortium (GISR)

<http://gisr-consortium.org/>

Presented by Piers Chapman, PhD

The vision of the Gulf Integrated Spill Research Consortium (GISR) is to understand and predict the fundamental behavior of petroleum fluids in the ocean environment. This capability is critical to inform decisions during response to oil spills and for development of mitigation plans, ultimately yielding significant environmental and financial savings. The mission of this proposal is to develop a multi-scale modeling system validated by field and laboratory experiments to track the pathways of transforming hydrocarbons released from deep oil spills in the Gulf of Mexico. Our approach will be to conduct a multi-scale suite of field and laboratory experiments that target critical deficiencies in our understanding of the physical, chemical, and biological behavior of petroleum fluids as they transit the Gulf from a deep oil spill to the beach, marsh, estuary, or atmosphere, and to synthesize this understanding through the application of a validated, multi-scale numerical model of petroleum fate and transport in the Gulf.

APPENDIX 3: ASSOCIATED MEETINGS AND EVENTS

(summaries included if provided)

Monitoring status and trends of long-lived marine vertebrates as a measurable indicator of restoration and long-term health of the Gulf of Mexico ecosystem

Monday, February, 16 9AM - 6PM, Galleria IV

Contact: Pamela Plotkin

As higher trophic level organisms, marine vertebrates play key roles in marine ecosystems. Their life history traits and high vagility make them especially vulnerable to a wide range of environmental stressors. Long-term studies to monitor the status and trends of marine vertebrates can provide measurable indicators of coastal and marine ecosystem status and health. As such, restoration efforts underway to restore and improve the long-term health of the Gulf of Mexico must incorporate long-term studies of marine vertebrates into the evaluation of the effectiveness of these efforts. The lack of critical baseline data as the foundation for subsequent research on the impacts of oil spills, threatens our ability to understand, respond to and mitigate the impacts of petroleum pollution and related stressors on long-lived marine vertebrates in the Gulf of Mexico and elsewhere. The goals of this session were to summarize the science that is underway to monitor the status and trends of marine vertebrates and identify critical data gaps with the aim of improving the science necessary to manage, assess and restore the Gulf of Mexico ecosystem.

Agenda

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| 9:00-9:10 | Introduction to the Session, Pamela Plotkin |
| 9:10-9:30 | Gulf of Mexico Long-term Monitoring Programs Case Study: Assessment of Marine Vertebrate Monitoring Programs and Gap Analysis, Matt Love, Alexis Baldera, Chris Robbins and Bob Spies. |
| 9:30-9:50 | Moving Towards a Region-wide Avian Monitoring Framework for the Northern Gulf of Mexico, Randy Wilson, Mark Woodrey and John Tirpak. |
| 9:50-10:10 | Tarpon Spawning and Larval Transport in the Northern and Eastern Gulf of Mexico, Jonathan M. Shenker, Mitchell Roffer and Aaron Adams. |
| 10:10-10:30 | Sea Turtle Monitoring in Pelagic and Neritic Habitats in the Gulf of Mexico, Michael Bresette, Jonathan Gorham and Kate L. Mansfield. |
| 10:30-10:50 | Passive Acoustic Monitoring of Dolphins in the Gulf of Mexico: 2010 to 2013, Kaitlin E. Frasier, Sean M. Wiggins, Danielle Harris, Tiago A. Marques, Len Thomas, Karlina P. Merkens and John A. Hildebrand. |
| 10:50-11:10 | Dispersal and Behavior of Oceanic-stage Sea Turtles in Oil-impacted Habitat of the Gulf of Mexico, Kate L. Mansfield and Nathan Putman. |
| 11:10-11:30 | Behavioral Patterns of Common Bottlenose Dolphins in Galveston, Texas, Alexandria E. Rivard. |
| 11:30-11:50 | Migratory Corridors of Adult Female Kemp's Ridley Turtles in the Gulf of Mexico, Donna J. Shaver, Kristen Hart, Ikuko Fujisaki, Cynthia Rubio, Autumn Sartain, Jaime Peña, Patrick Burchfield, Daniel Gomez Gamez, Raul de Jesus Gonzalez Diaz Miron, Hector J. Martinez Ortiz and Jaime Ortiz. |
| 11:50-1:00 | Lunch |
| 1:00-1:20 | Evolutionary Toxicology: Transgenerational Effects of Contaminant Exposure, John W. Bickham. |

- 1:20-1:40 Health Assessment of Common Bottlenose Dolphins (*Tursiops truncatus*) in Barataria Bay, LA following the Deepwater Horizon Oil Spill, Leslie B. Hart, Cynthia R. Smith, Teri K. Rowles, Forrest I. Townsend, Randall S. Wells, Brian C. Balmer, Michael M. Fry, Marina Ivančić, Mandy C. Tumlin, Eric S. Zolman and Lori H. Schwacke.
- 1:40-2:00 Changes in Immune Functions Associated with the Deepwater Horizon in Bottlenose Dolphins in the Northern Gulf Of Mexico, S. DeGuise, M. Levin, E. Gebhard, L. Jasperse, J.T. Saliki, L. Burdett Hart, C. Smith, S. Venn-Watson, F. Townsend, R. Wells, B. Balmer, E. Zolman, T. Rowles and L. Schwacke.
- 2:00-2:20 Polycyclic Aromatic Hydrocarbon Biomarkers in Deep Sea Fishes and Sharks in Association with the Deepwater Horizon Oil Spill Occurrence, Arianne Leary, Jim Gelsleichter and R. Dean Grubbs.
- 2:20-2:40 Effects of the Deepwater Horizon Oil Spill on Gulf Fish Populations: What Have We Learned? Jim Gelsleichter, Arianne Leary, R. Dean Grubbs, M. Heithaus, J. Marcus Drymon, D. Kerstetter and R.E. Hueter.
- 2:40-3:00 The Fragility of Recovery: Implications of the Dramatic Reduction of the Kemp's Ridley Population Growth Rate since 2010, Selina Heppell.
- 3:00-3:20 Tag-acquired Sperm Whale Dive Behaviors Reveal Unexpected Changes in Benthic Foraging Around Macondo Spill Site – a Potential Long-term Issue, Bruce Mate, Ladd Irvine and Martha Winsor.
- 3:20-3:40 Quantitative Declines in Mesophotic Reef Fish Abundance and Shifts in Community Structure across the Threshold of the Deepwater Horizon Event: Temporal and Spatial Contrasts, K.J. Sulak, P. Dixon, M. Randall, M. Price and U. Nash.
- 3:40-4:00 Changes in the Foraging Strategy of Kemp's ridley (*Lepidochelys kempii*) Sea Turtle Populations in the Northern Gulf of Mexico Post Deepwater Horizon Spill, Kimberly Reich, Donna J. Shaver, Claire Iseton, Melania Lopez-Castro, Christopher Schmitt and Michael J. Hooper.
- 4:00-4:20 Presence of Deep-Diving Cetaceans in the Gulf of Mexico during and Following the Deepwater Horizon Oil Spill, J. Hildebrand, S. Baumann-Pickering, K. Frasier, J. Trickey, K. Merckens, S. Wiggins, M. McDonald, T. Marques, D. Harris and L. Thomas.
- 4:20-4:40 The 2014 Kemp's Ridley Stock Assessment: Reduced Nesting or Reduced Nesters? Benny Gallaway and William Gazey.
- 4:40-5:00 Using Passive Acoustic Monitoring to Evaluate Acute Impacts and Chronic Influences of the Deepwater Horizon Oil Spill on Large Whale Species, Aaron N. Rice, Jamey T. Tielens, Janelle L. Morano, Bobbi J. Estabrook, Yu Shiu and Christopher W. Clark.
- 5:00-5:20 Gulf of Mexico Migratory Species: A Baseline for Conservation and Restoration, Jorge Brenner, Carly Voight and David Mehlman.
- 5:20-5:40 Self-help Marine Animals: Engaging Marine Mammals in Research that Aims to Protect Them, Chris Simoniello, Stephanie Watson, Barbara Kirkpatrick and Robert Currier.
- 5:40-6:00 Dolphins Modify Behaviors Due to Human Activity in an Important Foraging Habitat, Sarah Piwetz and Bernd Würsig.

Near Field Modeling Workshop

Monday, February, 16 1 - 6PM, Imperial Suite (24th Floor)

Contact: Scott Socolofsky, William Dewar

This workshop brought together those interested in the near field dynamics of subsea oil spills, including academic and industrial researchers, model users and developers, and federal agencies. Following for format of our previous workshops in Berkeley, CA, and Mobile, AL, we focused on the following five areas:

1. Initial droplet size distribution
2. Plume models (CFD and Integral Approaches)
3. Hydrodynamics coupling of near field models with the local ocean circulation (including interfacing with CFD ocean models)
4. Oil and gas coupling of near field models with far field transport models (generally, Lagrangian Particle Tracking models)
5. Bubble and droplet scale fate modeling (equations of state, dissolution, and simple biological decay)

The workshop format included presentations of on-going research and results followed by a discussion summarizing the major accomplishments during the past three years of work and outlining the remaining challenges for modeling in the near future.

Agenda

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|-------------|--|
| 1:05 – 1:20 | Welcome and Introduction (William Dewar and Scott Socolofsky) |
| 1:20 – 1:40 | Oil-in-Water Droplet Size Distributions Captured with a High-Pressure Sapphire Autoclave Cell (Zachary M. Aman, Claire B. Paris, and Michael Schlüter) |
| 1:40 – 2:00 | Turbulent Crude Oil Jets in Crossflow (David Murphy, Xinzhi Xue, and Joseph Katz) |
| 2:00 – 2:20 | PIV Measurement of the Residual Flow Following Abrupt Shut-off of a Bubble Plume (Chris Chung Kei Lai and Scott A. Socolofsky) |
| 2:20 – 2:40 | Observed Properties of a Bubble Plume Towed in Stagnant Homogeneous Water (Rob Uittenbogaard, John Cornelisse, and Scott A. Socolofsky) |
| 2:40 – 3:00 | Nearfield LES Simulation of Bubble Plumes in Oil Blowout: Statistical Analysis and Crossflow Influence (Bruño Fraga and Thorsen Stoesser) |
| 3:00 – 3:20 | Intrusion Dynamics of Small Oil Droplets Released from a Deep Ocean Blowout (Cindy Wang and E. Eric Adams) |
| 3:20 – 3:40 | Break |
| 3:40 – 4:00 | An Eulerian Large-Eddy Simulation Model of Buoyancy-Driven Multiphase Plumes in Stratified Flow (Di Yang, Bicheng Chen, Scott A. Socolofsky, Marcelo Chamecki, and Charles Meneveau) |
| 4:00 – 4:20 | Trapping Heights in Hot Multiphase Plumes (Alexandre Fabregat, Andrew C. Poje, and Tamay M. Özgökmen) |
| 4:20 – 4:40 | Hydrostatic Modeling of Buoyant Oil Plumes (Ashley Stroman, William Dewar, Bruno Deremble, and Nico Wienders) |
| 4:40 – 5:00 | Integral Models to Simulate Oil and Gas Blowout Plumes and Associated Chemical and Physical Process of Hydrocarbons (Anusha Dissanayake, Inok Jun, and Scott A. Socolofsky) |
| 5:00 – 5:20 | Modeling the Fate of Gas Bubbles in Deepwater Horizon Accidental Blowout with Hydrate Effect (Inok Jun, Anusha Dissanayake, and Scott A. Socolofsky) |
| 5:20 – 5:45 | Open Discussion |

GoMRI Hydrocarbons Analysis QA/QC Workshop

Monday, February, 16 1 - 6PM, Galleria III

Contact: Chris Reddy

In response to discussions at the Hydrocarbon Chemistry QAQC meeting during the 2014 Gulf of Mexico Oil Spill and Ecosystem Science Conference, the Gulf of Mexico Research Initiative (GoMRI) Research Board engaged the National Institute of Standards and Technology to help it conduct an intercomparison of methods and results and to better refine and improve reference analytes and levels. To address the need for hydrocarbon chemistry calibration, the GoMRI Research Board undertook the Hydrocarbon Intercalibration Experiment (HIE), realizing it is the responsibility of the scientific community involved in hydrocarbon analysis to continue to assure that everyone is doing the best science possible. The HIE was an effort by the GoMRI Research Board to further enable the best science.

The large network of chemistry laboratories involved in GoMRI research and other invited laboratories partnered with the National Institute of Standards and Technology (NIST) to analyze two oil samples, one from the Macondo Well and another weathered field sample from the Deepwater Horizon. Over 20 laboratories reported results on the chemical composition of the samples, toxicity, and physical properties.

On the afternoon of Feb 16, 2015 after welcome remarks from Dr. Margaret Leinen, Vice Chair of the GOMRI board, the analytical results were presented and discussed by Chris Reddy (Woods Hole Oceanographic Institution). Compared to known values and other indicators, the results were excellent but generally limited to only one class of petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs) and fewer results were contributed for the weathered oils. Areas of consistencies and differences were considered.

Others speakers included HIE participants, Buffy Meyer (LSU), Ryan Rodgers (FSU), and Chuck Miller (Tulane), as well as Terry Wade (Texas A&M) and Steve Wise (NIST).

Future intercalibrations were also discussed and how to expand to a larger range of compounds analyzed, including other sample matrices like sediment and tissues.

A final report comparing the classes of data analysis and discussions for future actions are under development. In particular, a section on "lessons learned" and "best practices" will be included.

Genomics and Metagenomics: Environmental Applications in Oil Spill Response and Recovery

Monday, February 16, 1:30-5:30pm, Galleria II

Contact: Chuck Wilson

The Gulf of Mexico Research Initiative (GoMRI) has created one of the largest networks of scientists addressing a single ecological issue. Realizing GoMRI's unique position, the GoMRI Research Board has undertaken targeted approaches for enabling the best science. To facilitate collaborative opportunities, sharing of methods, and identification of limitations in the genomics and metagenomics field, specifically, the GoMRI Research Board hosted the Genomics and Metagenomics: Environmental Applications in Oil Spill Response and Recovery Special Session to discuss genomics in the context of it being a powerful tool for detecting and following environmental impacts.

Whether addressing community structure, animal or human physiological response to challenges, or biotic interactions, all organisms respond to their environments on a molecular level. Such responses are mediated by genomes, proteomes, and metabolomes and can impact several scales of biological order and complexity. Further, changes in gene expression and protein assembly of plants or animals can substantially alter their responses to environmental insults. Understanding the drivers of organismal reactions and community stability, including resistance (insensitivity to disturbance) and resilience (the rate of recovery after disturbance), is important for predicting responses to disturbances at multiple biological levels.

Advances in -omics driven biology, including computation approaches, have provided microbiologists, oceanographers, marine biologists, and health science researchers with tools to address these challenges in new ways. Portraits of a community's genes, gene expression, and metabolite production can be represented in a single sample, providing insight into system-level stability. The use of multiple -omics platforms for human disease diagnosis and deeper understanding of disease pathogenesis is changing the face of medicine and public health. Such approaches can provide quantitative insight as to how disturbances, of which oil spills are one instance, impact complex biological systems.

The complexity and importance of this field is evidenced in the increasingly diverse array and number of genomics projects associated with GoMRI. GoMRI-supported investigators have already taken advantage of a number of genomics technologies to elucidate multiple consequences of the DWH oil spill. In order to adequately facilitate collaborative opportunities, sharing of methods, and identification of limitations, this special session included presentations from many experts in the field, including a subset of the GoMRI genomics researchers.

The special session opened with introductory comments from the GoMRI Research Board Chair, Dr. Rita Colwell. Dr. Colwell provided an overview of the utility of genomics science in an array of fields, as well as introduced two Research Board Members particularly interested in this line of investigation: Dr. Burton Singer and Dr. Kenneth Halanych. Drs. Singer and Halanych subsequently thanked the community for their attendance and introduced two leaders in the field as the session's keynote speakers. First, Dr. Jo Handelsman, Associate Director for Science at the White House Office of Science and Technology Policy, provided her own overview of the genomics and metagenomics field, starting with its history through its prospects for the future. Second, Dr. Barbara Methé, Professor in the Departments of Human Genome Medicine and Microbial and Environmental Genomics at the J. Craig Venter Institute, provided a more in-depth analysis of the most recent and influential research happening now in the genomics and metagenomics fields. These keynote discussions were followed by 14 brief presentations on GoMRI-supported genomics ongoing and proposed projects from the following individuals:

- Baker, Brett (DROPPS Consortium, PI Buskey) - Resolving metabolic pathways and microorganisms involved in coastal petroleum degradation using high-resolution community omics approaches
- Bernhard, Anne (CWC Consortium, PI Rabalais) - Coastal Waters Consortium: Summary of the genomic project rationale, goal(s) and approach
- Chistoserdov, Andrei (RFP-II, PI Klerks) - The effect of sediment bioturbators on the biological degradation of petroleum in coastal ecosystems – a genomic insight

- Griffitt, Joe (RFP-II, PI De Guise) - The combined effect of environmental and anthropogenic stressors on fish health
- Joye, Mandy (ECOGIG-2 Consortium PI) - Ecosystem Impacts of Oil and Gas Inputs to the Gulf-2-omics
- Kostka, Joel (C-IMAGE2 Consortium, PI Murawski) - Genomic Research within C-IMAGE2: Cross Gulf Comparison of Microbes to Megafauna Impacted by the Deepwater Horizon and Ixtoc Oil Discharges
- Kostka, Joel (Deep-C Consortium, PI Chassignet) - Metagenomic insights on the response and recovery of indigenous microbial communities in beach sands to the Deepwater Horizon oil spill
- Lopez, Jose (DEEPEND Consortium, PI Sutton) - Microbiome /Community Genomics Component Summary: DEEPEND (Deep-Pelagic Nekton Dynamics) Consortium
- Neigel, Joe (RFP-II PI) - Tissue-Specific Changes in Blue Crab Transcriptome after Exposure to Macondo Crude WAF
- Quigg, Antonietta (ADDOMEx Consortium PI) - Aggregation and Degradation of Dispersants and Oil by Microbial Exopolymers
- Scott, Nicole (RFP-II, PI Gilbert) - Hydrocarbon-degrading potential of uncultivated bacteria enriched by the Deepwater Horizon oil spill
- Sobecky, Patricia (ACER Consortium, PI Valentine) - DWH Oil Spill Impacts on Coastal Alabama: Genomic-based Insights of the Microbial Community Response from 2010-Present
- Spyropoulos, Demetri (RFP-II PI) - Fetal Origins of Obesity: Metabolites & Biomarkers in Offspring from Pregnancy-Linked Exposure to the COREXIT Component DOSS
- White, Helen (RFP-II, PI Kujawinski) - Using comparative metagenomics to analyze the microbial degradation of polar oil components.

The session concluded with a discussion about the strengths, challenges, and collaborative opportunities in –omics research, as well as a discussion on the next steps for GoMRI to enable the best science. Comments from participants centered around three key themes: information sharing, intercalibration exercises, and capacity building.

- 1) Participants noted the significant efforts underway in sequencing and asked that the Research Board consider ways to facilitate information sharing to reduce a duplication of efforts. Participants were also interested in there being information shared amongst groups about experiences and costs associated with contracting laboratories for sequencing.
- 2) There was significant discussion on the need to ensure informatics are scalable across studies and that metadata are consistent. Specific suggestions included the need for temporal and diversity scales to be quantified and the need to establish a consensus on necessary metadata information (e.g., salinity, temperature, georeference data). Intercalibration exercises may be an important first step in establishing these best practices.
- 3) Participants noted that another way to determine best practices would be to host a series of workshops for capacity building. Two workshops specifically suggested included a workshop on informatics and a workshop on computational approaches.

The special session concluded with special thanks from the GoMRI Research Board Chair, Dr. Colwell, and two Research Board members, Drs. Singer and Halanych.

COMPASS Workshops: Communicating Your Science

Monday, February 16 12:30-5:30pm

Tuesday, February 17, 12:30-2:00pm

Wednesday, February 18, 12:30-2:00pm, Royal Suite (24th Floor)

Contact: Heather Mannix

COMPASS offered three separate science communications training opportunities at the 2015 Gulf of Mexico Oil Spill and Ecosystem Science Conference. The half day student workshop used a combination of lecture and exercises to help participants develop a concise, accurate message about their science and increase willingness and ability to communicate with journalists and policymakers. It also included a module on the role of social media in science communication.

Two lunchtime workshops focused on walking participants through a tool called the message box to help scientists distill complex knowledge into the key messages that can engage audiences such as journalists, policymakers, or others who are not subject matter experts. Peer-to-peer exercises offered the opportunity to practice delivering the message.

COMPASS is a nonprofit organization that believes science, communicated well, is essential for a healthy future. We help scientists effectively engage in public discussions and decision-making processes about the environment. Our trainings, individual coaching, and real-world connections empower researchers to build communication skills and relationships.

Gulf Science and Restoration Programs Update and Panel Discussion

Wednesday, February 18, 5:15-6:45pm, Galleria II

Contact: Julien Lartigue

In this session, attendees heard short program updates including information on future funding opportunities from representatives from the National Academy of Sciences Gulf Research Program, Gulf of Mexico Research Initiative, National Fish and Wildlife Foundation Gulf Environmental Benefit Fund, NOAA RESTORE Act Science Program, North American Wetland Conservation Act program, and the Treasury Department, which is overseeing funding for the RESTORE Act Centers of Excellence. Following the updates, the program representatives participated in a panel discussion where they discussed coordination among the programs, environmental compliance issues for researchers, and answered questions from the audience. These questions include a request for more information on the eligibility of federal scientists to participate in the various science programs and how the programs were going to address the management of data resulting from the science activities the programs support.

Science Partnerships Enabling Rapid Response (SPERR): Design Session for Improving Scientific Collaboration during Oil Spill Crises

Wednesday, February 18, 7:00-8:00pm, Royal Suite (24th Floor)

Contact: Lindley Mease

In this evening session, the Science Partnerships Enabling Rapid Response (SPERR) project team led a dialogue around solutions to the science collaboration challenges that emerged during the BP oil spill. We described the potential solutions that have been co-designed by the project's advisors, which include government oil spill responders (USCG, NOAA, EPA, USGS) and academic scientists with relevant expertise. We explored the potential flaws and opportunities for these ideas to generate positive impact on the efficient and effective exchange of information during large marine oil spills and other environmental disasters. We used innovative facilitation tools to foster candid dialogue and spur idea generation around how we may increase scientific collaboration within the disaster life cycle moving forward.

APPENDIX 4: MEDIA & NEWS RESULTS

QUANTIFYING SUCCESS:

News media attendance:

- Over 30 members of news media registered

News media outlets represented, include:

The Houston Chronicle; NPR (Local affiliate); CNN (documentaries); Al Jazeera; Science News; Bloomberg.com; Science (magazine); E&E News; Univision; KPRC (Local NBC affiliate); Rigzone.com; Energy Intelligence

News coverage:

Searches through Business Wire and Google News returned 437 examples of coverage before, during, and after the meeting. The coverage includes stories in newspapers & magazines; on radio & television; and on various Internet sites, including blogs & press-release aggregators.

Article example:

Studies: BP spill reduced Gulf life

<http://www.houstonchronicle.com/news/houston-texas/houston/article/Studies-BP-spill-reduced-Gulf-life-6084391.php?t=8a27cb347eb82edad4&cmpid=twitter-premium>

Total Circulation:

To date, total circulation for the event is 270,015,824.

Social Media Statistics:

- Twitter account: 72 Followers
- Twitter hashtag (#gulfscienceconference) use: 215
- Facebook: 103 Followers

For further information, please contact Kristin Kracke at kkracke@oceanleadership.org or 202.787.1644.

NEWS STORIES

Date	Headline, <i>Publication</i> <i>Link</i>	Circulation
2/17/2015	Studies: BP Spill Reduced Gulf Marine Life, <i>Alaska Dispatch News</i> http://www.adn.com/article/20150217/studies-bp-spill-reduced-gulf-marine-life	51,266
2/16/2015	2015 Gulf oil spill conference to highlight new scientific research, <i>Akken.com</i> 2015-gulf-oil-spill-conference-highlight-new-scientific-research	n/a
2/16/2015	Studies: BP spill reduced Gulf life, <i>Houston Chronicle</i> http://www.houstonchronicle.com/news/houston-texas/houston/article/Studies-BP-spill-reduced-Gulf-life-6084391.php?t=8a27cb347eb82edad4&cmpid=twitter-premium	7,293,277
2/19/2015	Hundreds of scientists meet to highlight oil spill, ecosystem research, <i>KPRC Houston</i> http://www.click2houston.com/news/hundreds-of-scientists-meet-to-highlight-oil-spill-ecosystem-research/31373704	617,346
2/21/2015	Disaster Imparts Lessons That Still Pay Off for Researchers, <i>LNG Intelligence</i> http://www.energyintel.com/pages/login.aspx?fid=art&DocId=877344	14,567
3/3/2015	NIEHS highlights public health and disaster research at oil spill conference, <i>Environmental Factor</i> http://www.niehs.nih.gov/news/newsletter/2015/3/spotlight-oilspill/index.htm	n/a
2/26/2015	Five Years Later, Scientists Gather to Assess Ongoing Impact of BP Oil Spill, <i>Mississippiriverdelta.org</i> http://www.mississippiriverdelta.org/blog/2015/02/26/five-years-later-scientists-gather-to-assess-ongoing-impact-of-bp-oil-spill/	n/a
2/5/2015	2015 Gulf oil spill conference to highlight new scientific research, <i>EagleFordTexas.com</i> http://eaglefordtexas.com/news/id/145936/2015-gulf-oil-spill-conference-highlight-new-scientific-research/	137,365
4/20/2015	Deepwater Horizon Fifth Anniversary, <i>Houston Matters Radio Show (KUHF-FM)</i> http://www.houstonmatters.org/show/2015/04/20/deepwater-horizon-fifth-anniversary-mondays-show-april-20-2015	n/a
Total:		8,113,821

PRESS RELEASE #1: FOR IMMEDIATE RELEASE

January 15, 2015

Media Contact:

Kristin Kracke

202.787.1644

kkracke@oceanleadership.org

Five Years Since the Deepwater Horizon Oil Spill: What We Know Now: 2015 Gulf of Mexico Oil Spill & Ecosystem Science Conference to Highlight Latest Oil Spill and Ecosystem Science Research Results in Houston, Texas

Washington, D.C. – As the five year anniversary of the 2010 Deepwater Horizon Oil Spill approaches, oil spill-related experts from academia, state & federal agencies, non-governmental organizations and industry, will soon come together to highlight oil spill and ecosystem science research at the 2015 Gulf of Mexico Oil Spill & Ecosystem Science Conference. The Conference, organized by a diverse group of partners, will take place February 16-19, 2015 in Houston, Texas and will focus on scientific content that seeks to answer, What have we learned? What does it mean? How can it be used?

The four-day Conference will consist of 19 scientific sessions with 270 oral presentations and 240 poster presentations. Topics to be covered include:

- Dispersant-oil chemistry, impacts and interactions
- New dispersant technologies and improved response tools
- Oil behavior under deep blow-out and high pressure
- Microbial ecosystems
- Data management, modelling and decision making
- Impacts on benthic communities, coastal ecosystems and ecological processes
- Public health and socio-economics

A searchable database of abstracts for oral and poster presentations as well as the full Conference schedule is available online [here](#).

The Conference Keynote presentation will be given by Dr. Richard W. Spinrad, the National Oceanic and Atmospheric Administration's Chief Scientist, on Tuesday, February 17 at 8:30 a.m. CST. This will be followed by a special Plenary Session where the Principle Investigators of the Gulf of Mexico Research Initiative's eight RFP-I Consortia will give Conference attendees a summary of their respective findings from the past three years. Several associated events and workshops will also be held throughout the Conference. For a full list, [click here](#). The Closing Plenary, which will summarize the key findings presented during all of the sessions at the Conference, with an emphasis on Where do we go next?, will take place on Thursday, February 19th at 1:30 p.m. CST.

The registration fee will be waived for credentialed members of the media. Please send your contact information (name, media outlet, email, and phone) to Kristin Kracke and she will send you details on how to complete your complimentary registration online. Online registration will close on February 6, 2015.

For accommodation information, [click here](#).

For more information, visit the Conference website and follow the Conference on Facebook and Twitter ([#gulfsienceconference](#)).

PRESS RELEASE #2 FOR IMMEDIATE RELEASE

February 5, 2015

Media Contact:

Kristin Kracke

202.787.1644

kkracke@oceanleadership.org

New Scientific Research to be Released at 2015 Gulf of Mexico Oil Spill & Ecosystem Science Conference: Over 1,000 Scientific Experts Expected in Houston, Texas

Washington, D.C. – Did the Deepwater Horizon Oil Spill impact food webs? How would the Northeast Atlantic respond in the event of a deep water oil spill? Do chemical dispersants affect microbial degradation of hydrocarbons? What are the characteristics of airborne oil droplets? Answers to these questions, and many more, will be discussed at the 2015 Gulf of Mexico Oil Spill & Ecosystem Science Conference, where oil spill-related experts from academia, state & federal agencies, non-governmental organizations and industry, will highlight oil spill and ecosystem science research from February 16-19, 2015 in Houston, Texas.

During the four-day Conference, there will be 19 scientific sessions with 270 oral presentations and 240 poster presentations. Overall session topics include:

- Dispersant-oil chemistry, impacts and interactions
- New dispersant technologies and improved response tools
- Oil behavior under deep blow-out and high pressure
- Microbial ecosystems
- Data management, modeling and decision making
- Impacts on benthic communities, coastal ecosystems and ecological processes
- Public health and socio-economics

During session #006, Emerging Ecological Impacts of the Deepwater Horizon Oil Spill: Evaluating Ecosystem Change and Resiliency, one presentation will reveal the chronic effects of the Deepwater Horizon Oil Spill on reef fish as well as the evidence of surprising resiliency.

A presentation during session #007, Making a Living on Hydrocarbons: Diversity, Metabolic Potential, and Regulation of Microbial Hydrocarbon Oxidation, will divulge how oil degrading microbial communities in the Northeast Atlantic would respond in the event of a deep water oil spill. Authors of another presentation plan to discuss how their study results will help inform the general understanding of how chemical dispersants affect rates of microbial degradation of hydrocarbons in Gulf surface waters.

In session #008, Air-Sea Interactions and Oil Spills: Progression from Semi-Empirical to Physics-Base Models, one group of scientists will present findings that will provide quantitative data and statistics that are essential for the modeling of aerosolization of oil slicks by rainfall and the associated health concerns.

During session #011, Improving Tools for Marine Oil Spill Response: Lessons Learned and Applied, a presentation will contain a realistic visualization rendering technique to trace the evolution of oil well blowouts, which could influence possible future first response efforts.

A searchable database of all abstracts for oral and poster presentations as well as the full Conference schedule is available online [here](#).

The Conference Keynote presentation will be given by Dr. Richard W. Spinrad, the National Oceanic and Atmospheric Administration's Chief Scientist, on Tuesday, February 17 at 8:30 a.m. CST. This will be followed by a special Plenary Session where the Principle Investigators of the Gulf of Mexico Research Initiative's eight RFP-I Consortia will give Conference attendees a summary of their respective findings from the past three years. Several associated events and workshops will also be held throughout the Conference. For a full list, [click here](#). The Closing Plenary, which will summarize the key findings presented during all of the sessions at the Conference, with an emphasis on Where do we go next?, will take place on Thursday, February 19 at 1:30 p.m. CST.

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For more information, visit the Conference website and follow the Conference on Facebook and Twitter ([#gulfsienceconference](#)).

The conference press releases were reported by media outlets all over the world:

10KLFY	FOX 5 KVVU-TV	My Central Oregon	Switching Gears
1st Discount Brokerage	FOX23-WXXA	My Motherlode	Synacor
40-traders	Fox29 WFLX	MyrtleBeachOnline.com	The Beaufort Gazette
4-traders.com	Fresno Bee	Nationals Restaurant News	The Sun News
740 KVOR	Globalbank	Nations Restaurant News	The-Review.com
A.M. Best Company	Great American Advisors	NBC-2	TriCity Herald
Acullen	Green Faucet	Network Journal	Valley News Live
Alliance Review	HeraldNet Everett Washington	News and Observer	Value Investing News
AmbrustAviation.com	HeraldOnline.com	News Channel 5/CBS	WallStreetSelect
American Public Media	HPC Wire	Alexandria	WATE
Anchorage Daily News	Hydro Review	News channel 6	WECT TVG
Armbrust	Idaho Statesman	News Tribune	WETM 18
Ashland Times Gazette	Industrial Info	Newschannel 34-WVIT/	WFAA
Ask.com	Infostor	WBGH	WhatLNG
AZCentral.com	Inside Metals	Newsday	Whittier Daily News
Beaufort Gazette	InsideBayArea.com	Newsobserver.com	Wichita Eagle
Belleville News-Democrat	Intelligent Value	Nfclub.eu	WICU/WSEE
Bellingham Herald	International Business Times	Oak Ridger	WKRC-Local 12
Beverly Hills Chamber of Commerce	Investing Daily	Oakland Tribune	WKRN News 2
Beyond the Dow	InvestorPlace	Oil & Gas Journal	WLNS 6 News
BioOptics World	Investtalk	Oklahoma's Own News 6	WMBB News 13abc
Biospace.com	Island Packet	Oklahoma's Own News 9	WOIO Action News 19
BiznessIQ	Issuer Direct	Oklahoman	WorkBoat
Boston Globe	KAIT	Oklahoma's Own News 6	Working 4 You
BP Trade	Kansas City Star	Oklahoma's Own News 9	World Energy Source
Bradenton Herald	KARN News Radio	Olympian	World Net Daily
Buffalonews.com	KGET-17	One News Page Global	Worth
Businesswire.com	KGMB/KHNL Hawaii News	One News Page US	WOWKTV.com
Cablevision/Optonline	KGPE CBS-47	Ontario Daily Bulletin	WQOW TV
CablingInstall	KLRT-Fox 16	OptoIQ	WRAL
CanBiotech	KLTV 7	Pasadena Star-News	WREX 13
Carlsbad Current-Argus	KMEG 14	Pipeline & Gas Journal	WSJV Fox 28
Centre Daily Times	KMPH Fox 26	Pittsburgh Post-Gazette	WSYR - ABC Newschannel 9
CEO World News	KNOE 8 News	Press-Enterprise	WTEV-CBS47
Charlotte Observer	KOAM-CBS 7	Quoteline	WTNZ FOX 43
Cincinnati Enquirer	KPLC TV 7	RCR Wireless News	WTRF.com
CommodityCareers	KPTM Fox 42	RecordPub.com	WTZN Fox 43
ContraCostaTimes.com	KSAN Concho Valley	Redlands Daily Facts	WVNSTV.com
Crescent-News	KSFY Action News	Renewable Energy World	WVVA TV
Daily Breeze	KTIV News 4	Rockford Register Star	WXOW News 19
Daily Herald	KTRE 9	Ruidoso News	WZVN ABC 7
DailyBuletin.com	KTTC	Sacramento Bee	Yahoo! Finance
Daily-Jeff.com	KUTV.com	San Bernardino Sun	Yahoo! Finance India
Daily-Record.com	KWQC Channel 6	San Gabriel Valley Tribune	Yahoo! Singapore
Dallas Morning News	KWWL	San Jose Mercury News	
Dealbreaker	KXLT Fox 47	San Luis Obispo Tribune	
Deming Headlight	Las Cruces Sun-News	San Mateo County Journal	
Dental Economics	Laser Focus World	San Mateo County Times	
Denton Record-Chronicle	Ledger-Enquirer	San Mateo Daily Journal	
Deseret News	Lexington Herald-Leader	Santa Cruz Sentinel	
El Nuevo Herald	Long Beach Press-Telegram	SciAnswers.com	
El Paso Times	Macon.com Telegraph	Search Bug	
Emoneydaily	Market Intelligence Center	Sector Publishing Intelligence	
Energy Magazine	Market Pulse	Ltd	
Eyewitness News	MarketWatch	Securities Technology Monitor	
eZanga	Maxim Group	Sign On San Diego	
Farmington Daily Times	Miami Herald	SiliconValley.com	
Fat Pitch Financials	Minneapolis-St. Paul Star	SmartGridCareers	
FayObserver	Tribune	Star Telegram	
Financial Sense	Minnesota Public Radio News	State	
Fort Worth Star-Telegram	Q	Stock Briefings	
FOX 12 Oregon	Minyanville.com	Stock Nod	
Fox 29 WFLX	ModestoBee.com	StreetInsider	
	Money Show	Sun Herald	



