Core Area 2 Workshop: Fate of Oil

A Workshop under the Gulf of Mexico Research Initiative's Synthesis and Legacy effort

June 12-14, 2019
Washington, D.C.

Welcome

On behalf of the Consortium for Ocean Leadership (COL), which represents our nation's leading ocean science, research, and technology organizations from academia, industry, and aquariums, I welcome you to Washington, D.C. and the Gulf of Mexico Research Initiative (GoMRI) Core Area 2 synthesis workshop on the *Fate of Oil.* As you spend the next several days synthesizing findings across the Core Area 2 subtopics, I hope you will let us know if there is anything that will make your time in the COL spaces more comfortable and productive.

Thank you for spending your valuable time on this effort!

Sincerely,
Jonathan W. White, RADM (ret.), USN
President and CEO, COL

Special Thanks

The GoMRI Research Board would like to thank Uta Passow and Ed Overton for their dedicated effort in organizing this workshop, along with the many individuals from the GoMRI community who have worked so diligently on Core Area 2 Synthesis.

Code of Conduct

COL has recently adopted an event code of conduct that provides guidance to all event participants – panelists, speakers, audience, vendors, etc. – on behavioral expectations. The policy, which mirrors that of the American Geophysical Union, is intended to ensure a harassment-free and inclusive event experience for everyone. Please review the full policy on pages 13 and 14 of this booklet.

Workshop Schedule

Wednesday June 12: Setting the stage

8:00 – 9:00 Coffee and breakfast available

9:00 – 9:10 Welcome (Michael Feldman, Chuck Wilson)

9:10 – 9:25 Marching Orders (Research Board)

9:25 – 9:45 Fates structure (Ed Overton)

9:45 – 10:15 Question development (Uta Passow)

10:15 – 10:45 Break

10:45 – 11:30 Impacts of Methods and Techniques on Results (Ryan Rodgers - presentation 30 min, 15 min discussion)

11:30 – 12:15 Photochemical Fate Impacts (Collin Ward - presentation 30 min, 15 min discussion)

12:15 – 1:15 Lunch

1:15 – 2:15 Biodegradation & Omics Fate Impacts (Joel Kostka - presentation 40 min, 20 min discussion)

2:15 – 3:00 Oil/Particle Interactions and MOSSFA (Antonietta Quigg - presentation 30 min, 15 min discussion)

3:00 – 3:20 Break

3:20 – 4:00 Dispersants (Vijay John - presentation 30 min, 10 min discussion)

4:00 – 4:30 Revisit List of Questions

Thursday June 13: Working Groups

8:00 – 9:00 Coffee and breakfast available

Twelve ***working groups*** focusing on the links and connections of the fates and their interconnection: Each working group consists of different people, working groups are assigned to ensure a good mix of expertise, thus each person will be in 3 WG, one per period.

1. WG-period 1: groups 1-4; 9:00 – 10:30
2. WG-period 2: groups 5-8; 11:00 – 12:30
3. WG-period 3: groups 9-12; 1:30 – 3:00
4. Reports from A-team leads on all WG-groups; 3:30 – 4:30

Coffee Breaks: 10:30-11:00 & 3:00-3:30; Lunch: 12:30 – 1:30

Friday June 14: Wrap up

8:00 – 9:00 Coffee and breakfast available

9:00 – 9:15 Charge for the day

9:15 – 9:45 Outreach plans (Emily Maung-Douglass)

9:45 – 10:30 Synthesis (synthesizing the WGs into one picture)

10:30 – 11:00 Break

11:00 – 11:30 Synthesis (continued)

11:30 – 12:00 Work Assignments, lead authors, final author discussion

12:00 – 12:30 Wrap up

Questions to guide breakout group discussion

1. **What is the fate of the oil with focus on chemical composition and transformative processes** – fate of specific compounds over time and processes that changed the composition of oil (photo-degradation, biodegradation, uptake (ingestion, adsorbtion, inhalation); *Note: some processes do not transform oil compounds but work selective on some, e.g. dissolution, aggregation, but here the focus is on composition and transformation*:

Minutes to hours: polar species dissolve, natural gas, 50% of low molecular weight aromatics, *n*-alkanes accumulate in deep plume, remainder made it to surface highly volatile components rapidly escaped to the atmosphere and the less volatile fraction formed surface slicks of weathered oil enriched in *n*-alkanes and polycyclic aromatic hydrocarbons (PAHs). Expand, specify

Days: How did the chemical composition of both fractions change and which processes brought this change about?

Weeks: How did the chemical composition change as surface oil remained floating (subject to weathering), stranded at beaches, marshes, and mangroves, or was included in marine oil snow? How was the chemical composition of oil in the plume affected as oil spread (dilution) and stranded (DeSoyto Canyon)? What were the relevant processes mediating this change?

Months to years: How did oil composition change for oil that sank to the seafloor via MOS and was deposited there, and for oil that was stranded on beaches/ in wetlands, or remained in the water? How did the composition change for the oil from the plume that stranded at depth? What were the mediating processes?

Addendum: Can we budget how much was oxidized where and by which transformation process?

2. **Focusing on location and transport (oil distribution), how do these factors effects the fate** – where was oil when, how did it get there and how did that impact the transformation processes? *Note: Transport processes include evaporation, currents, sedimentation (buoyancy), mixing,*

Minutes to hours: The oil separated into surfaces slick and deep plume: How did these environments differ and determine this separation? A how did processes affecting oil transport (evaporation, spreading, dispersion, dilution, sedimentation) differ in the different environments? And how did those transport processes determine the distribution of oil (which ones were important when and where?). How did location of oil impact the transformative processes like biodegradation and photo-oxidation? (e.g. which processes were how important at the surface vs in the deep plume? (*Note*: *Keep in mind that some of processes transform the chemical composition (e.g. photo-oxidation, dissolution, biodegradation), others change the distribution/ location of the oil (evaporation, spreading, dispersion, dilution, sedimentation), and others do*

both (coagulation with marine particles or formation of bacterial agglomerations and subsequent sedimentation).

Days to weeks: What was the relative distribution of oil (deep water, surface waters, shallow waters and coastal areas including beaches and marshes)? Are the specific distribution patterns a consequence of the physical properties of oil? How did the environmental conditions change (e.g. as oil stranded at the surface or at the seafloor), and how did that affect the relative importance of the different transformative processes impacting the oil? What was the relative role of biodegradation for oil that is stranded vs on deep sediments vs in the water? Was the fate of dispersed oil different from that in surface slicks? How?

Months to year: Did the physical distribution of weathered oil still change after weeks, or was oil at its "final destination" three to four weeks after it got released? What where the final destinations of the petrocarbon (air, seafloor, beaches, mangroves, (uptake) biomass, water) and which fraction of the oil ended up in each of these? Did this change over time as the spill continued? What is the long-term fate (> year) of sedimented oil (on seafloor), of stranded oil (beaches, wetlands etc)?

Addendum: How much was the fate impacted by the specific conditions of the GoM (e.g. would we expect similar fate if the identical spill had been in the Arctic?)

3. What are the **impact of the different response measures for the fate of oil**– how did each response measures affect the fate of the oil (change the pathways or processes of importance)?

Minutes to months: How did a) the application of dispersant, b) in situ burning (ISB), and c) the opening of aqueducts (influx of nutrients and particle-rich fresh water) impact the fate of the oil? Consider i) the physical distribution, ii) the chemical composition and iii) the relative importance of ultimate (months to years) fates (e.g. biodegradation, sedimentation, stranding, dilution in water).

4. **What are the relative importance of different oil transformation processes in water and on land** – (evaporation, photo-oxidation, dissolution, dispersion, dilution, spreading, stranding, sorption, coagulation, formation of bacterial agglomerations, sedimentation, uptake by marine organisms (inhalation, ingestion, coating)

Minutes to years: Which processes where important during the different time spans? E.g. How much oil was channeled into the marine food web, onshore, biodegraded…? What was the relative importance of different transformation processes for the fate of oil and how did that change over time? Which factors determined the relative importance? How would the relative importance change in a different environment (e.g. Arctic), or if a different (heavier) oil were spilled?

5. **How did photochemical oxidation influence microbial community composition, biodegradation, metabolic rates and other transformation processes?**

Minutes to years: How did this interaction change over time? How did this interaction differ in different environments (deep plume vs slick vs stranded, …)?

6. **How do marine dissolved organic matter (DOM) and marine particles** (cells (other than hydrocarbon degrading bacteria), feces, detritus, lithogenic and biogenic inorganic particles**) impact the distribution and transformation processes of oil or oil-dispersant complex?** *(Note: oil-particle associations include OPAs, where oil droplets are coated with fine mineral particles, marine snow sized aggregates formed by coagulation of oil droplets with marine algae and detritus, or biofilm like bacterial agglomerations, oil derived hydrocarbons transported in TOC of mineral laden coastal waters).*

How does DOM interact with oil or oil-dispersant? How is biodegradation and photo-oxidation impacted if OPAs or oil-diatom aggregates form? How do microbial exudates interact with oil? Does the formation of oil-particle associations affect biodegradation, photo-oxidation or ingestion of oil? How important are DOM and marine particles in determining the fate of oil?

Glossary for Oil Researchers from Different Disciplines

- **Aerosol Formation**: the process of producing very fine atmospheric particles of the oil residuals-liquid material from the action of breaking waves and high wind energy.
- **Biodegradation**: bacterial (Bacteria or Archaea) catalyzed oxidation, i.e. degradation of hydrocarbon molecules by microbes, which generates energy that supports life and additional biomass through the reproduction of these microbes.
- **Burial**: the process of covering of oil residuals-semisolids and -viscous liquids by mineral muds and/or sand once the oil materials are stranded on the shorelines and/or sink to the seafloor.
- **Chemical Dispersion:** the breaking of oil residuals into tiny droplets (10–300 μm) by the application of manufactured chemicals that break the surface tension of the oil/oil residuals and allow wind/wave/turbulent actions to break oil/oil residuals into tiny dispersed oil droplets. The droplets are so small that they are essentially neutrally buoyant. Thus, rather than rising and coalescing, they are carried away and diluted by currents. This process greatly increases the surface area of the spilled oil/oil residuals and promotes degradation via biofilm formation and metabolism.
- **"Water or Oceanic" Currents:** the movement of the water column caused by thermohaline circulation, riverine flow, tides and wind.
- **Dead Oil**: spilled oil that has been stripped of its natural gas content and contains only the liquid oil, a mixture of hydrocarbon type materials, including volatile and soluble compounds like BTEX and higher alkylated benzenes and naphtalenes, as well as higher molecular weight hydrocarbon type compounds. Tanker and pipeline accidents are usually spills of dead oil.
- **Dispersant**: manufactured chemical mixtures that are meant to disperse the spilled oil by reducing the surface tension of the oil residuals-liquids, allowing wind and wave energy to break surface slicks into tiny droplets that are mixed into the water column. Well-head injection of dispersants can allow for a greater dispersion of tiny oil droplets in deep water near the broken well-head. Commonly, this application of dispersants increases dilution, so that oil is dispersed and then diluted into the aqueous phase. This dissolution is generally of low molecular weight hydrocarbon alkanes and aromatic compounds. Bio-dispersants are dispersants harvested from microbial production.
- **Dispersing**: the process of breaking oil and oil residual-liquid material into very tiny droplets, either from the energy of winds and waves, the energy of jetting from broken piping, or from the application of chemical surfactants, and thereby allowing for the movement of dispersed oil droplets away from the location of the spilled oil.
- **Dissolution**: this is when a solute is dissolved into a solution, with regards to oil, it is the removal of low molecular weight hydrocarbon molecules from the oil and oil residual phases, through partitioning with the aqueous phase, into the water. These low molecular weight compounds are somewhat water soluble even though they may be considered immiscible liquids, and can be dissolved from spilled oil and oil residuals (see dissolved oil). Dissolved hydrocarbon type compounds are readily available for uptake via inhalation and adsorption, as well as susceptible to biodegradation and photo-oxidative processes.
- **Dissolved Oil**: petroleum compounds dissolved from the oil and oil residuals into the water phase (usually low molecular weight alkanes and 1, 2 and 3 ringed aromatics and their alkyl homologs).
- **Dissolved Organic Matter (DOM)**: dissolved organic matter is commonly operationally defined as organic matter that cannot be removed from water by filtration (>0.45 μm). The composition of natural DOM in seawater is complex; containing multiple aromatic rings, it is

spatially and temporally variable and largely uncharacterized. In the context of an oil spill, DOM (or petroleum DOM) generally represent high molecular weight oxidized petroleum molecules with abundant polar groups that allow these large molecules to become water-accommodated (in essence soluble). This material is not readily detected by the usual chromatographic analytical methods but can be seen using UV fluorescence. Not included in this DOM definition are the relatively lower molecular weight hydrocarbon type molecules that are somewhat water-soluble (i.e., low molecular weight hydrocarbons partitioned from the spilled oil). DOM, in the context of an oil spill, has a very different meaning than the very abundant natural DOM in coastal-marine environments.

- **Emulsify**: the process of mixing oil and water together into a stable viscous, lightly colored oily material that is more difficult to degrade, skim, burn, or disperse than the non-emulsified oil.
- **Entrainment**: the entrapment of one substance by another substance, with regards to oil, the process defines the mixing of oily residuals with sediment and detritus particles, leading to the burial of the oily material.
- **Live Oil**: spilled oil that contains a mixture of natural gas and liquid hydrocarbon materials, as is usually found when released directly from reservoirs, such as is seen in a well blow-out caused spill.
- **Marine Oil Snow**: marine snow that contains oil compounds, either via sorption of dissolved compounds, or via trapping of dispersed oil droplets or oil residual particles. It may also form due to bacterial activity in response to oil hydrocarbon's exposure. This exposure results in copious production of exudates by bacteria exposed to certain oil residuals, allowing for the development of complex microbial communities within a mucus matrix, functionally similar to bio-films. To date, very little is known about this process, but many characteristics (sinking properties, appearance) of this marine oil snow are similar to the fluffy marine snow material formed by the incorporation of oil residual particles into marine snow (see marine snow).
- **Marine Snow**: defined as composite particles (>0.5 mm), marine snow may be formed by a variety of pathways, including zooplankton activity and coagulation of marine particles. Common types of marine snow include diatom (algae) or miscellaneous-fecal aggregates, disrupted large fecal pellets and discarded feeding structures, e.g. from appendicularians (larvaeceans) or pteropods. Because of their large size, marine snow sinks rapidly, often hundreds of meters per day. Marine snow is very sticky and capable of trapping particles it encounters during transit, including droplets of oil residuals, thus transporting these materials to the seafloor.
- **Oil**: a very complex mixture of hydrocarbons, non-hydrocarbons (hydrocarbon molecules containing either N, S, or O) and trace levels of heavy metals, produced from the degradation of the organic remains of living organisms. When this biomass is deposited deep underground and subjected to heat and pressure for millions of years, the vast majority of carbon containing molecules in the buried biomass is chemically reduced to molecules containing carbon and hydrogen (i.e., a chemical reduction from carbon molecules that contain some oxygen content to carbon molecules that are depleted of their oxygen content). Typically, this mixture contains hydrocarbon type molecules with carbon numbers from 1 to over 100, with the C1 to C4 hydrocarbon molecules being gaseous at room temperatures and pressures, while larger hydrocarbons type molecules, which are liquids, viscous liquids, waxes, and solids, make up the complex mixture known as crude oil. Oil in natural reservoirs can also be called petroleum.
- **Oil Derived Fossil Carbon**: during oil spills, hydrocarbon compounds that are oxidized either by microbial activity or by photo-oxidation may be metabolized into biomass that chemically represents modern organic matter but carries the isotopic signature of carbon from the spilled oil.

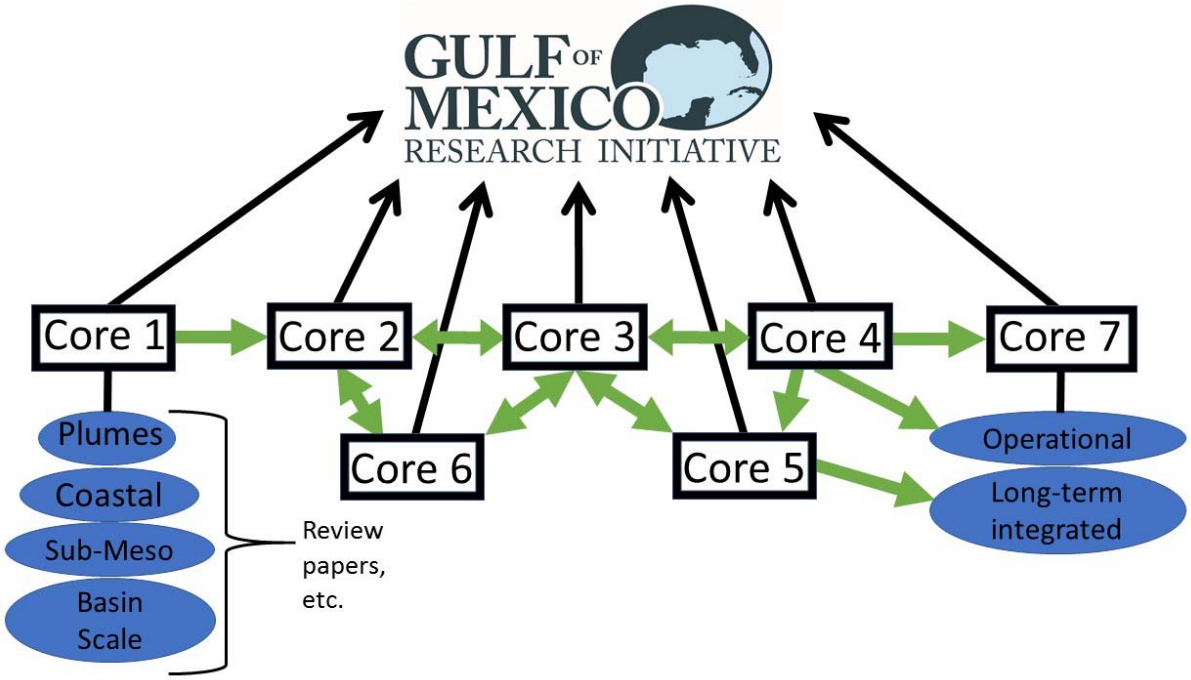
- **Oil-Mineral Aggregates (OMA)/Oil-Sediment Aggregates (OSA) Formation**: the formation of small (20-100 μm) oil-mineral particle associations, called "oil mineral aggregates" or "oil-sediment aggregates". These are generated by the interaction of lithogenic (inorganic and abiotic) particles with oil residuals. During aggregation of tiny oil droplets with such mineral particles, the mineral particles cover, and even pierce the oil droplets. OMAs may sink or float depending on their excess density, e.g. the relative contribution of oil and mineral particles. Near the shore, the formation of such oil-sediment aggregates allows the natural dispersal and removal of the oil residuals stranded on shorelines. Application of mineral fines, e.g. as a mediating treatment or with drilling mud during the top-kill procedure of the Deepwater Horizon incident, may also lead to the formation of such OMAs and their sedimentation and sinking. Natural mineral particle concentrations in most offshore environments are not high enough to lead to large OMA formation events.
- **Oil-Particle Aggregates (OPA)**: this term is sometimes used to jointly characterize both OMA/OSA type particles and marine oil snow. Although appearance, characteristics, and fate, as well as formation mechanisms differ between these different particle types, a continuum of particle-oil associations exist in natural aquatic environments.
- **Oil Residuals**: the remaining complex mixture of hydrocarbon type compounds (alkanes, cycloalkanes, benzene, and PAH compounds, and their respective alkyl homologs, resins, and asphaltenes) minutes after the oil is spilled, and from which certain low molecular weight saturate and aromatic compounds have evaporated or dissolved. These initial oil residuals have thus been depleted of most of their volatile and soluble compounds. As oil residuals weather further, the chemical composition and the amount of hydrocarbons and non-hydrocarbons keeps changing, and can include the addition of new compounds to the mixture produced mostly via photo-oxidation. Oil residuals are compositionally distinct from the initially spilled oil.
- **Particulate Organic Matter (POM)**: is a measurement of (is composed of) all live plus detrital organisms or parts thereof, exempting inorganic shells or frustules.
- **Photo-oxidation**: oxidation reactions caused by the interaction of light with hydrocarbon type molecules at the sea surface or near surface environments. The adsorption of photons from sunlight catalyzes the reaction of hydrocarbons to produce oxidized hydrocarbons in either the air or water phases, and in oil residuals at the water-atmosphere interface. These reactions encompass several common processes:
    (i) photo-excitation: colored chemical species of crude oil (e.g., polycyclic aromatics, asphaltenes, resins) directly absorb light which excites the species and causes the loss of an electron
    (ii) partial photo-oxidation: oxygenation of crude oil molecules by light as, for example, when the electron from (i) reacts with molecular oxygen to form what are commonly called Reactive Oxygen Species (ROS) e.g. hydroxyl radical, and singlet oxygen. ROS can indirectly react with a wide range of chemical species in crude oil (i.e., not just colored chemical species), leading to the production of oxygenated compounds
    (iii) complete photo-oxidation to CO2 (photo-mineralization).
- **Physical Dispersion:** the breaking of oil residuals into tiny droplets by action of winds and waves. The droplets are so small that they are essentially neutrally buoyant. Thus, rather than rising and coalescing, they are carried away and diluted by the currents. This process greatly increases the surface areas of the spilled oil/oil residuals and promotes degradation via biofilm formation and metabolism.

- **Possible Coalesce**: dispersed oil does not naturally coalesce. However, in long-term spill events, like the Deepwater Horizon oil spill, it is possible that droplets of either naturally or chemically dispersed oil residuals will come into contact with floating oil residuals and become incorporated as part of the oil residual at the water-atmosphere interface.
- **Sinking/Stranding**: the movement of hydrocarbon type molecules and oil residuals to the seafloor and/or shoreline, either in association with sinking particles, or with the water motion.
- **Solubilization**: the process of mixing oil residuals with water that enhances the movement of hydrocarbon molecules from the oil residual phase into the aqueous phase.
- **Sorption onto Lithogenic or Biogenic Particles**: the attachment of hydrocarbon molecules, dissolved in the water, onto marine particles such as algae, feces, or sediment grains.
- **Spilled Oil**: the complex mixture of hydrocarbons and non-hydrocarbons that is spilled into the environment directly either from the production reservoir, or from release points during its production, transportation, refining, or usage. The initial composition of the spilled oil is rapidly (in minutes) changed after spillage. Spilled oil directly from a reservoir is often called live oil.
- **Spreading**: the movement of floating oil residuals and dispersed oil droplets away from the location of the spilled oil. Spreading is caused by gravitational flow, winds, and currents.
- **Tides:** water movement caused by both the moon's and the sun's gravitational force and modified regionally and locally by the geomorphology of the seafloor and coastal areas/shoreline, and wind and weather (tidal current).
- **Total Organic Carbon (TOC)**: the sum of dissolved and particulate organic carbon in water samples, or the carbon containing organic material associated with mineral particles (not including carbonate minerals).
- **Uptake via Ingestion**: hydrocarbon type molecules that are dissolved, dispersed, or associated with particles (e.g. with OMAs or marine oil snow) which may be orally taken up by marine life(organism).
- **Uptake via Inhalation & Adsorption**: hydrocarbon type molecules that are dissolved or dispersed in the water column may be taken up by organisms via sorption through the gills/ skin/ foliage or via breathing.

GoMRI's Synthesis Efforts

The Gulf of Mexico Research Initiative (GoMRI) will come to an end in 2020 after 10 years of dedicated research efforts to understand the impacts of the Deepwater Horizon oil spill. GoMRI is synthesizing knowledge to ensure that GoMRI's scientific achievements and advances will be available to scientists, the user community, and responders. To best capture a comprehensive scientific synthesis, eight Core Areas of focus were identified along with a set of guiding principles to maintain consistency throughout the entire synthesis effort. Learn more about GoMRI's synthesis efforts, the eight Core Areas and the series of workshops that have already occurred and will continue in the coming year, at gulfresearchinitiative.org/gomri-synthesis/.

This workshop, *Fate of Oil*, will contribute significantly to GoMRI Synthesis Core Area 2.



This diagram illustrates the interrelated nature of the GoMRI Core Areas. The green arrows indicate critical lines of communication. Each Core Area has multiple subtopics, as shown here in the Core Area 1 example. The Core Area 8 advisory group will play a unique and crucial role throughout all the Core Areas promoting the effective application and communication of GoMRI funded science between the research and user communities. Products from the subtopics, designed for a scientific audience within that specific field, will help inform a product for each Core Area that is written for scientific audiences in all fields. Eventually, all Core Area products will inform synthesis products for the general public.

GoMRI findings, including the data and peer reviewed publications, are publicly available. This data and information legacy will promote continual scientific discovery and public awareness of the Gulf of Mexico ecosystem. Visit data.gulfresearchinitiative.org and research.gulfresearchinitiative.org to learn more!

Dinner Recommendations around COL's office:

ToroToro- Latin Steakhouse
1300 I Street, NW
http://www.richardsandoval.com/torotorodc/

Woodward Table
1426 H Street, NW
http://woodwardtable.com/

Brasserie Beck- Belgian
1101 K Street, NW
http://www.beckdc.com/

Acadiana- Creole
901 New York Avenue, NW
http://www.acadianarestaurant.com/

Cuba Libre- Cuban
801 9th Street, NW
http://www.cubalibrerestaurant.com/

Bobby Vans Steakhouse-Steaks
1201 New York Avenue, NW
http://www.bobbyvans.com/ny-ave.html

Capitol City Brewery-American
1100 New York Avenue, NW
http://www.capcitybrew.com/

DBDG
931 H ST NW
http://www.dbgb.com/dc

The Smith
901 F St NW
http://thesmithrestaurant.com/location/washington-d-c/

Momofuko
1090 I Street NW
https://ccdc.momofuku.com/

Umaya Izakaya
733 10th St NW
umayadc.com

Centrolina - Italian
974 Palmer Alley NW
centrolinadc.com

Consortium for Ocean Leadership
Event Participant Code of Conduct & Anti-Harassment Policy

Policy on Harassment

As a community organization, the Consortium for Ocean Leadership (COL) regularly organizes and hosts events, including meetings, workshops, conferences, trainings, and educational events, with members from multiple sectors within the ocean science and technology community and its stakeholders. COL is dedicated to providing a harassment-free and inclusive event experience for everyone regardless of gender identity and expression, sexual orientation, disabilities, physical appearance, race, nationality, age, religion, or any other protected category. COL will not tolerate unlawful harassment or behavior that creates an intimidating, hostile, or offensive environment at any of the events it organizes or co-organizes in any location throughout the world. All event participants are required to abide by this Code of Conduct, which is adapted from the American Geophysical Union and complies with the new directive from the National Science Foundation.

Sexual harassment is a specific kind of unlawful harassment and includes sexual advances, requests for sexual favors, unwelcome or offensive touching, and other verbal, visual or physical conduct of a sexual nature that has the purpose or effect of creating a hostile work environment. Harassment can include, but is not limited to, comments, cartoons, "jokes," e-mail messages, computer images, physical conduct (including gestures), horseplay, stereotyping, and unwelcome touching.

Expected Behavior of Event Participants:

- Treat others with respect and consideration; value a diversity of views and opinions.
- Be considerate, respectful, and collaborative.
- Communicate openly with respect for others, critiquing ideas rather than individuals.
- Avoid personal attacks directed toward other participants.
- Be mindful of your surroundings and of your fellow participants.
- Alert COL staff if you notice a dangerous situation or someone in distress.
- Respect the rules and policies of the event, as well as of the contracted hotel, facility, or venue.

Unacceptable Behavior includes, but is not limited to:

- Harassment, intimidation, or discrimination in any form.
- Physical or verbal abuse by anyone to anyone, including but not limited to a participant, speaker, guest, staff member, volunteer, sponsor, etc.
- Unwelcome sexual attention or advances.
- Personal attacks directed at other participants, speakers, guests, members, staff, etc.
- Alarming, intimidating, threatening, or hostile comments or conduct.
- Inappropriate use of nudity and/or sexual images in public spaces or in presentations.
- Threatening or stalking anyone, including a participant.
- Other conduct which could reasonably be considered inappropriate in a professional setting.

Consequences:

- Anyone requested to stop unacceptable behavior is expected to comply immediately, regardless of whether the request comes from the target of the behavior, a bystander/witness, a member of the COL staff, or another person in charge of the meeting.
- COL staff (or their designee) or security may take any action deemed necessary and appropriate, including immediate removal from the event without warning or refund (to include travel reimbursement).
- COL reserves the right to prohibit attendance at any future event.
- Notification of an infraction to the offender's home institution.

Reporting Unacceptable Behavior:

If you see someone behaving disrespectfully, you are encouraged to respectfully discourage them from such behavior. Expect that others in the community wish to help keep the community respectful and welcome your input in doing so.

If you experience or witness disrespectful behavior and are uncomfortable or unable to respond or resolve it respectfully (for any reason), please immediately bring it to the attention of a COL staff member or the meeting chairperson/leader. Notification should be done by contacting a COL staff person on site or by emailing your concern.

Anyone experiencing or witnessing behavior that constitutes an immediate or serious threat to public safety is advised to contact 911 and locate a house phone and ask for security.

COL staff member responsible for this meeting:
Michael Feldman (GoMRI Program Manager), mfeldman@oceanleadership.org or 202-448-1226

Other COL reporting points of contact:
Teena Curry (Meetings and Travel Specialist), tcurry@oceanleadership.org or 202-787-1620
Alicia Schoshinski (Human Resources), hr@oceanleadership.org or (202) 787-1642