

**Workshop Charge:** What new research and methods have been developed that can be applied to operational oil spill modeling in the future and how do we do it?

- Review the state of the art of operational modelling before GoMRI.
- Establish the advances that have already been made or are now achievable as a result of GoMRI research.
- Discuss how the different session topics inter-relate, and where the new science has been (or still needs to be) incorporated into modeling.
- Identify desirable future developments, the opportunities for achieving them, and remaining gaps in the knowledge and technology required.

## ***Workshop Schedule***

### ***Day 1: Tuesday October 15, 2019***

8:00 Breakfast

8:45 – 9:00 *Welcome/Introductions, Callan Yanoff, GoMRI*

9:00 – 9:15 *GoMRI Synthesis and workshop vision, John Shepherd and David Halpern, GoMRI Research Board*

9:15 – 9:30 *Workshop overview, Villy Kourafalou, University of Miami and Chris Barker, NOAA*

9:30 – 9:45 *NOAA's outlook on operational oil spill modeling, Scott Lundgren, NOAA*

#### **I. Operational Oil Spill Modeling Aspects**

9:45 – 10:30 **Operational center examples (Chair: Gregg Jacobs, Naval Research Laboratory)**  
*(describe state-of-the-art w/ examples before and after the DwH oil spill.)*

- Chris Barker  
*How did NOAA (National Oceanic and Atmospheric Administration) support the oil spill emergency with oil spill forecasts, and how researchers and operative staff cooperate during the DwH (Deepwater Horizon) in 2010.*
- Guillaume Marcotte, Environment and Climate Change Canada  
*Environment and Climate Change Canada operational support to oil spills and technological transfer frameworks*
- Knut-Frode Dagestad, Norwegian Meteorological Institute  
*How the NMI supports an oil spill emergency with oil spill forecasts and how researchers and operative staff cooperate.*

10:30 – 11:00 Morning break

11:00 – 12:00 **Government, industry and other users: How to prepare for and operate through oil spills (Chair: Greg Jacobs)**  
*(describe state-of-the-art w/ examples before and after the DwH oil spill: Risk assessment, preparedness and emergency procedures, incl. how researchers and operative staff cooperate.)*

- Brian Zelenke, BOEM  
Oil Spill Risk Analysis (OSRA) at the Bureau of Ocean Energy Management
  - Don Danmeier, Chevron  
*An operator's perspective on subsea modeling*
  - CJ Beegle-Krause, SINTEF
  - Steve Buschang, Texas General Land Office
- 12:00 – 1:00 Lunch
- 1:00 – 1:10 Recap on morning sessions (**Gregg Jacobs**)
- II. **Operational Oil Spill Modeling Aspects part II**  
*(Research for process understanding, modeling & operationalization globally and regionally in the Gulf of Mexico)*
- 1:10 – 2:30 **Ocean circulation models and operationalization (Chair: Villy Kourafalou)**  
*(including data assimilation, observational needs for forcing and evaluation)*
- Keynote speaker: Nadia Pinardi, University of Bologna  
*Operational ocean forecasting: state of the art and future challenges*
  - Aijun Zhang, NOAA  
*Overview of NOS Coastal Ocean Forecast Systems*
  - Rafael Schiller, FUGRO  
*Operational modeling within the O&G Industry: challenges and lessons-learned*
  - Eric Chassignet, Florida State University  
*New frontiers in Gulf of Mexico ocean circulation modeling and prediction*
  - Shuyi Chen, University of Washington  
*Earth System Modeling for Integrated Environmental Prediction over the Gulf of Mexico: Progress, Challenges, and Ways Forward*
- 2:30 – 3:00 Afternoon break
- 3:00 – 4:00 **Processes influencing oil transport (Chair: Lianyuan Zheng, NOAA)**
- Villy Kourafalou  
*Land-sea interaction: River fronts influencing hydrocarbon transport*
  - Yannis Androulidakis, University of Miami  
*Coastal to offshore interaction: hydrocarbon transport in the open sea*
  - Tamay Ozgokmen, University of Miami  
*Submesoscale processes influencing hydrocarbon transport*
  - Gregg Jacobs, Naval Research Laboratory  
*Observational needs for forecasting ocean transport*
- 4:00 – 4:15 Recap on afternoon sessions (**Villy Kourafalou and Lianyuan Zheng**)
- 4:15 – 5:30 Plenary discussion on afternoon sessions (**Moderator: Nadia Pinardi**)
- 5:30 Adjourn for the day; Reception on the rooftop (refreshments provided)

## **Day 2: Wednesday, October 16, 2019**

8:00 Breakfast

8:30 – 8:45 Second-day welcome and introductions, Villy Kourafalou and Chris Barker

### **III. Modeling Oil Fate and Transport**

8:45 – 9:45 **Operational oil trajectory modelling (Chair: John Shepherd)**  
(describe state-of-the-art w/ examples before and after the DwH oil spill)

- Chris Barker  
*How does NOAA support oil spill emergency response with oil spill forecasts, and how did NOAA cooperate with researchers during the DwH in 2010*
- CJ Beegle-Krause  
*OSCAR (Oil Spill Contingency And Response) trajectory predictions*
- Knut-Frode Dagestad, Norwegian Meteorological Institute  
*Oil trajectory predictions and operational applications using OpenDrift*
- Nadia Pinardi  
*Operational applications with the MedslikII oil spill model*

9:45 – 10:20 Plenary discussion on 1<sup>st</sup> morning session (**John Shepherd**)

10:20 – 10:30 Recap of 1st morning session (**Moderator: John Shepherd**)

10:30 – 11:00 Morning break

11:00 – 12:15 **Recent advances in operational oil models and future needs (Chair: Chris Barker)**  
(describe state-of-the-art w/ examples before and after the DwH oil spill)

- Keynote speaker: Jerry Galt, Genwest Systems Inc  
*History and Current State of the art of Oil Spill Modeling*
- Scott Socolofsky, Texas A&M University  
*Plume modeling / Dissolution*
- Michel Boufadel, New Jersey Institute of Technology  
*Droplet size distributions*
- Dalina Thrift-Viveros, NOAA  
*New developments: degradation*
- Anusha Dissanayake, RPS  
*Oil fate process modeling/MOSSFA*

12:15 – 1:15 Lunch

1:15 – 1:20 Recap of 2<sup>nd</sup> morning session (**Chris Barker**)

1:15 – 2:30 Panel and plenary discussion on 2<sup>nd</sup> morning session (**Moderator: Chris Barker**)  
(Panelists will consist of the speakers from the previous session)

#### **Oil fate processes:**

*New developments: importance of vertical entrainment and mixing*

*New developments: degradation*

#### **Current state of the art:**

*Oil-Sediment Aggregate formation*  
*Evaporation/Dissolution/ Emulsification*

**Modeling gaps:**

*Marine snow sedimentation and flocculent accumulation (MOSSFA) formation*  
*Photolysis -- role in emulsification and/or tarball formation*

IV. **Discussion of the Most Important Aspects for Synthesis**

- 2:30 – 3:15 U.S. agency and organizational perspectives on science in support of operational oil spill modeling (**Chair: David Halpern**)
- Eric Lindstrom, NASA
  - Dana Savidge, NSF
  - Kelly Oskvig, NASEM
- 3:15– 3:20 Plenary and breakout group assignments (**Chair: Eric Chassignet**)
- 3:20 – 5:30 Breakout group discussions (Coffee break provided)

There are three breakout groups led by a moderator and a rapporteur. Each breakout group should address the same questions. Each group is responsible for a write up and report out Friday morning.

**1) Progress in ocean circulation modeling**

- a. What are the limitations of current ocean circulation models, especially their ability to drive oil fate and transport models (eg. physics, scales resolved, couplings, etc.)?
- b. What physical processes and parameters that are essential for oil spill prediction and forecast need to be better captured in ocean circulation models (eg. submesoscale, diffusion, near-surface and vertical velocities etc.)?
- c. How can the ocean circulation models be improved (eg. algorithms, data assimilation, etc.)?
- d. Where do you see the ocean circulation models in 5 to 10 years from now? What should the priorities be (eg. higher resolution, improved forcing, more data to better constrain/validate the models, etc.)?

**2) Progress in oil spill modeling**

- a. What are the limitations of current oil spill models, especially for prediction and forecast?
- b. Are the current oil spill operational models missing critical processes?
- c. How can the oil spill models be improved (*in addition to improvements linked to ocean circulation models*)? Is there a mechanism in place to incorporate the latest research?
- d. Are there operational requirements that should be included in ocean circulation models? (e.g. file formats, grid definitions, export of parameterizations and forcing functions, etc.).
- e. Where do you see the oil spill models in 5 to 10 years from now? What should the priorities be?

**3) Addressing model uncertainty**

- a. How do we understand and quantify the uncertainty in ocean circulation models?
  - i. And how to pass that on to oil spill models?
- b. How do we understand and quantify the uncertainty in oil spill models?
  - i. How can that uncertainty be communicated to users?
- c. Do ensemble forecasts reduce uncertainty, how should they be done, and are they feasible operationally?

- 5:30 Adjourn for the day; Self-organized dinners

***Day 3: Thursday, October 17, 2019***

8:00 Breakfast

**V. Getting Ready for Synthesis and Legacy**

9:00 – 12:00 Synergizing workshop objectives and Synthesis (**Chair: Eric Chassignet**)

- Reporting-out from breakout groups (group leaders)
- Plenary discussion: Identify desirable future developments, the opportunities for achieving them, and remaining gaps in the knowledge and technology required
- Finalize writing responsibilities for synthesis

12:00 – 1:00 Adjourn for the day; Lunch provided

12:00 – 2:00 Organizing committee meeting