

## RESEARCH DOSSIER

# Marine Oil Spills in Canada

*Oil spill related research work and expertise in the MEOPAR Network*

## Introduction

MEOPAR provides over \$16.75 million in funding to research and development projects related to marine risk in Canada. The network now includes more than 70 researchers and over 160 highly qualified personnel from universities across Canada - all with expertise in marine hazards and risk reduction. This research dossier provides highlights of our work specifically addressing oil spill related risk in Canada, and underscores our ability to expand research in this field through new partnerships with government and industry.

## About MEOPAR

The Marine Environmental Observation Prediction and Response Network is building Canada's capacity to anticipate and respond to marine risk. A national network, MEOPAR achieves its aims by funding interdisciplinary research, developing highly qualified personnel with expertise in marine risk, and by connecting academic research and technology to partners and end-users in government, industry and the public sphere.

MEOPAR was created through the federal Networks of Centres of Excellence Program in 2012, and is hosted at Dalhousie University in Halifax, Nova Scotia. Dr. Douglas Wallace, Canada Excellence Research Chair in Ocean Science and Technology, serves as MEOPAR's Scientific Director.

## Partnership Opportunities

MEOPAR and its academic researchers regularly engage with partners from government, the private sector and non-governmental organizations. These organizations partner with MEOPAR in a variety of ways, including:

- Collaborating on research projects
- Providing support for research projects (cash and/or in-kind) - some partner contributions are eligible for matching funds from MEOPAR
- Developing highly qualified personnel through internships and other training activities
- Sharing knowledge through conference and event participation and/or sponsorship

## THE MEOPAR NETWORK

### RESEARCH

**\$16.75 Million** in Research Funding

**59** Marine Risk Research Projects

### PEOPLE

**70+** University Researchers

**160+** Highly Qualified Personnel

**190+** Public, Private, and Government Partners

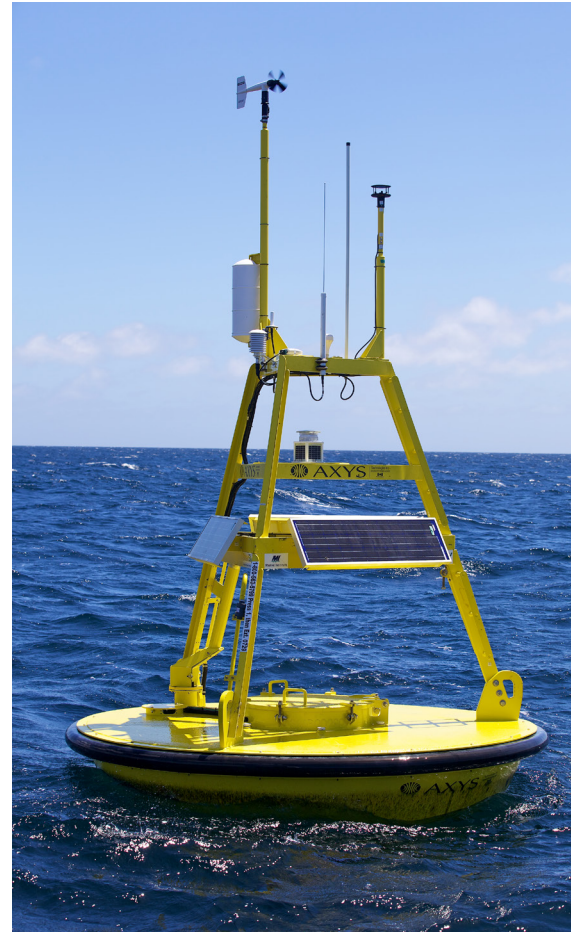
# OBSERVATION

MEOPAR is playing a lead role in improving the capacity and integration of ocean observing systems in Canada and internationally. Observation technology and infrastructure form the backbone for ocean prediction and response planning, and are vital for assessing the ocean environmental conditions that lead to oil spills and that affect oil spill trajectories.

## Research and Development

MEOPAR projects that are creating, adapting and/or upgrading relevant observational capabilities include:

- Developing a new integrated observation and prediction system for Halifax Harbour (Nova Scotia)
- Expanding an integrated observation and prediction system for the Strait of Georgia, British Columbia (in collaboration with Ocean Networks Canada)
- Expanding an Atlantic Scotian Shelf observation system
- Developing a coastal radar system focused on new ways of measuring currents and waves in the Halifax approaches
- Developing a new tethered profiler that can be deployed during marine emergencies
- Modifying the DORADO autonomous vehicle to assist with ocean experiments, including oil dispersion experiments
- Providing training workshops on the use and calibration of autonomous underwater vehicles for ocean observation work
- Partnering with exactEarth Ltd. to provide our network with satellite ship tracking data, a valuable resource for spill hazard assessment



## Key Expertise

**Dr. Douglas Wallace**  
Dalhousie University  
Canada Excellence Research  
Chair: Ocean Science and  
Technology  
Scientific Director, MEOPAR  
Expertise: observation technology

**Dr. Marcel Babin**  
Université Laval  
Canada Excellence Research  
Chair: Remote Sensing of  
Canada's Arctic Frontier  
Expertise: Arctic observation,  
remote sensing, ocean colour

**Dr. Susan Allen**  
University of British Columbia  
Expertise: coastal oceanography,  
mesoscale meteorology, ocean  
biogeochemical-physical  
interactions

**Dr. Brad deYoung**  
Memorial University  
Expertise: Observation technology  
and modeling

**Dr. Jinyu Sheng**  
Dalhousie University  
Expertise: Ocean modeling  
and prediction systems

## PREDICTION

MEOPAR researchers work closely with partners at Environment Canada, Fisheries and Oceans Canada, the National Oceanic and Atmospheric Administration and other government, scientific, and international agencies as part of their work developing new and/or improved models and prediction systems for the ocean environment. Although most of these models are applicable to marine weather and oceanic forecasting in general, several are specifically directed at oil spill analysis and forecasting.

### Research and Development

MEOPAR projects that are creating or improving predictive models and/or analysis related to oil spills include:

- A new, three-dimensional, subsurface oil blowout model to provide more accurate information on when, where and how much oil will surface, and what the thickness of the oil slick will be
- A new high resolution (~500m) relocatable forecasting model, which includes specialty models such as the oil spill blowout model (see above), for Halifax Harbour and eventually for all Canadian waters
- A study analyzing shipping traffic and local risk factors in the North Atlantic to identify where oil spills might occur

### Key Expertise

#### Dr. Keith Thompson

Dalhousie University  
Canada Research Chair (Tier I),  
Marine Prediction and  
Environmental Statistics  
Expertise: Coupled oceanic and  
atmospheric modeling, data  
assimilation

#### Dr. William Perrie

Fisheries and Oceans Canada &  
Dalhousie University  
Expertise: coupled  
atmosphere-ocean studies,  
remotes sensing of ocean  
surface features, ocean surface  
processes

#### Dr. Katja Fennel

Dalhousie University  
Canada Research Chair (Tier II),  
Marine Prediction  
Expertise: Data assimilation  
techniques, biogeochemical  
modeling

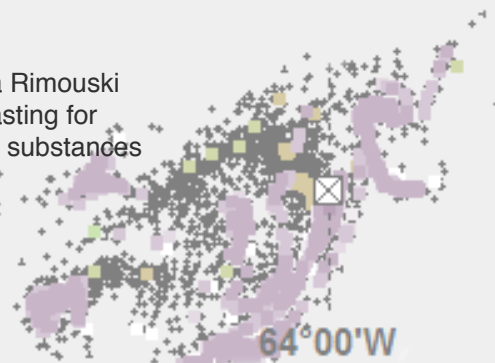
#### Dr. Harold Ritchie

Environment Canada &  
Dalhousie University  
Expertise: Coupled oceanic and  
atmospheric modeling

#### Dr. Dany Dumont

Université du Québec à Rimouski  
Expertise: Drift forecasting for  
surface objects and substances

*Background image: computer model of a deepwater oil spill on the Scotian slope*



## Ocean Surface Dispersion Experiment

MEOPAR researchers have proposed a large scale, surface dispersion experiment off the coast of Nova Scotia for the summer of 2016. If approved, researchers will release a benign, traceable substance at the surface of the ocean and track its movement and dispersion. They would then use the experimental data and observations to improve oil spill forecasting models. This experiment would also lay the foundation for a later study simulating an ocean-floor release.

Pending approval, MEOPAR will provide approximately \$1 million to the project, although additional support through cash and/or in-kind contributions is needed.



# RESPONSE

MEOPAR supports research and knowledge sharing activities that help communities, industries, policy-makers and emergency responders take direct action to better prepare for and respond to marine hazards and emergencies. This includes risk mitigation activities such as prevention planning and infrastructure analysis as well as research that improves marine response, such as remediation techniques and community impact modeling.

## Research and Development

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Three MEOPAR studies are currently evaluating the impacts of oil spills and the efficacy of remediation techniques:

- A study evaluating the fate of oil with and without chemical dispersants in Canada to facilitate rapid decision making on the use of chemical dispersants, and to improve dispersant use policy
- A study investigating the physiology and diversity of marine bacteria to improve prediction of microbial bioremediation response to marine oil spills in Canada
- A study investigating the relative socio-economic vulnerability of coastline sections to spills based on Environment Canada models and other indices

## Key Expertise

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### Dr. Haibo Niu

Dalhousie University

Expertise: Oil spill modeling, oil dispersant modeling

### Dr. Casey Hubert

University of Calgary

Expertise: Microbial bioremediation response to marine oil spills in Canada

### Dr. Ronald Pelot

Dalhousie University

Associate Scientific Director, MEOPAR

Expertise: Maritime risk and traffic analysis, resource allocation for improved response

### Dr. Stephanie Chang

University of British Columbia

Expertise: Socio-economic impacts and indicators of marine hazards (including oil spills)

### Dr. Anthony Charles

Saint Mary's University

Expertise: Coastal community response and resilience to marine hazards (including oil spills)



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