Collaborations toward building a comprehensive program to address oil spill containment and response in Arctic Regions

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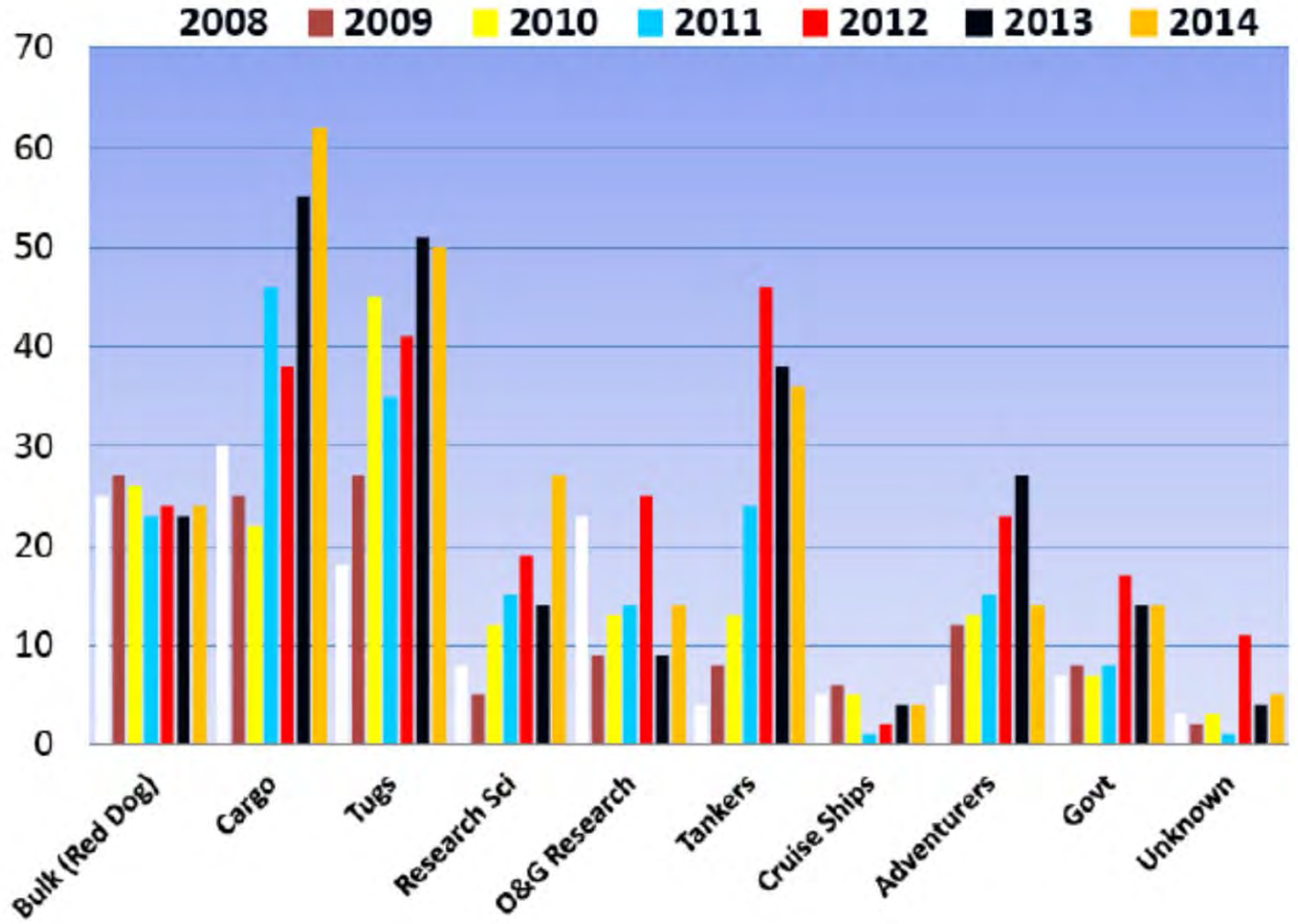


Arctic vessels in D17 area of concern

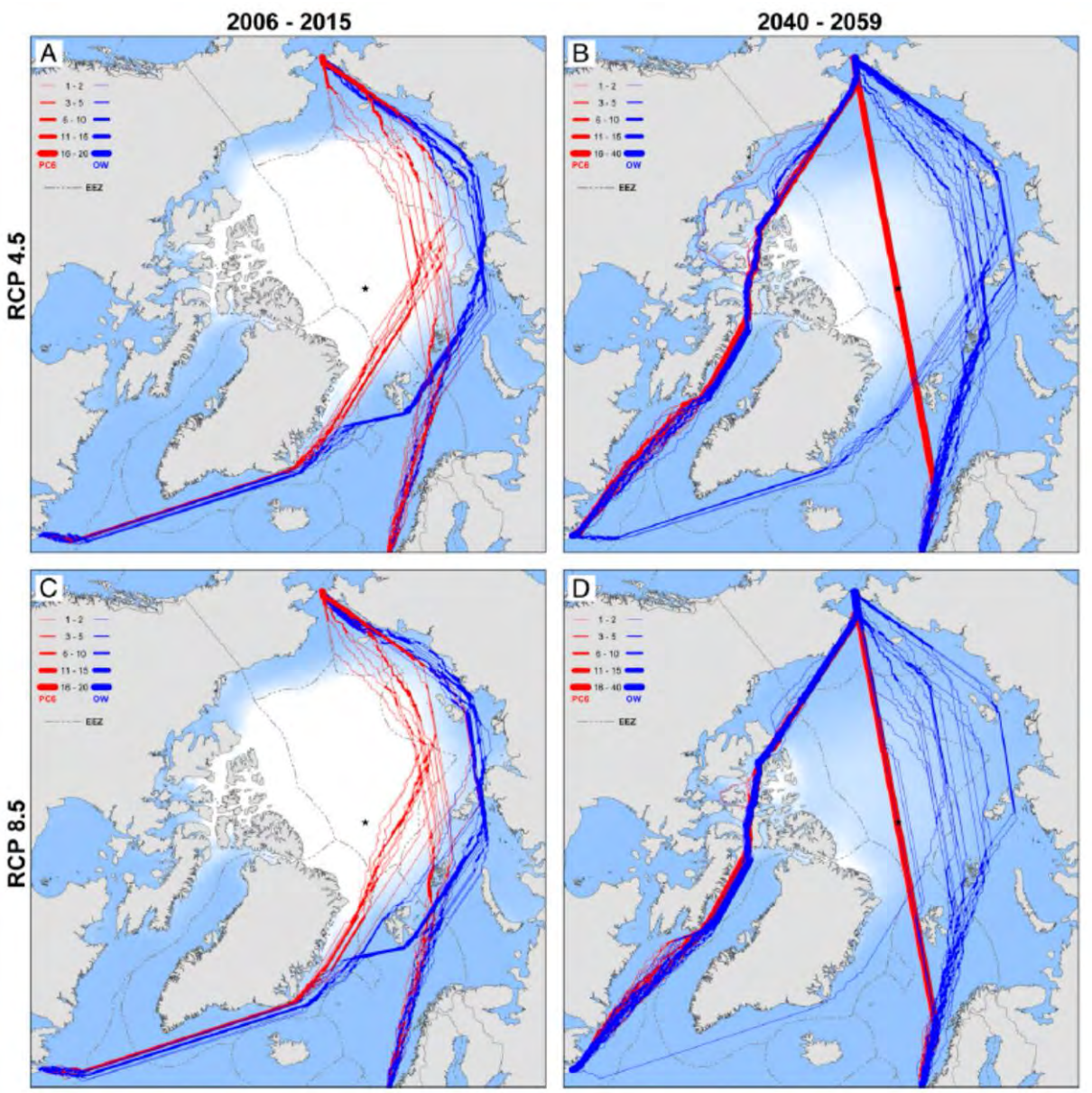
2008 = 120
2009 = 130
2010 = 160
2011 = 190
2012 = 250
2013 = 240
2014 = 250

Bering Strait Transits

2008 = 220
2009 = 280
2010 = 430
2011 = 410
2012 = 480
2013 = 440
2014 = 340

2008-2014 Arctic Shipping Activity (from USCG, 2015)

Hypothetical ships crossing the Arctic Ocean between the North Atlantic (Rotterdam, The Netherlands and St. John's, Newfoundland) and the Pacific (Bering Strait)



Smith and Stephenson, PNAS, 2013

Enhancing Oil-Spill Monitoring and Response
The Arctic Challenge

- Development of Operational, Multi-Sensor Capability
- Improved Oil Trajectory Modeling in Ice-Covered Waters
- Understanding Toxicity and Biodegradation of Dispersed Oil
- Study fish and wildlife health and linkages to human health, and human exposures
- Establishing effective methods of recovery in ice dominated waters and in extreme cold and dark conditions.

We need to strive for adaptation of new and emerging technologies, stronger partnerships, data fusion, and improved modeling, forecasting and planning.

Improving Environmental Security & Oil-Spill Response Through an Integrated Coastal Observing System

*Remote sensing** (km-scale): Coastal environments & infrastructure, ice hazards

*Coastal radar** (sub-km scale): Vessel & ice tracking, ice dynamics & potential disaster response

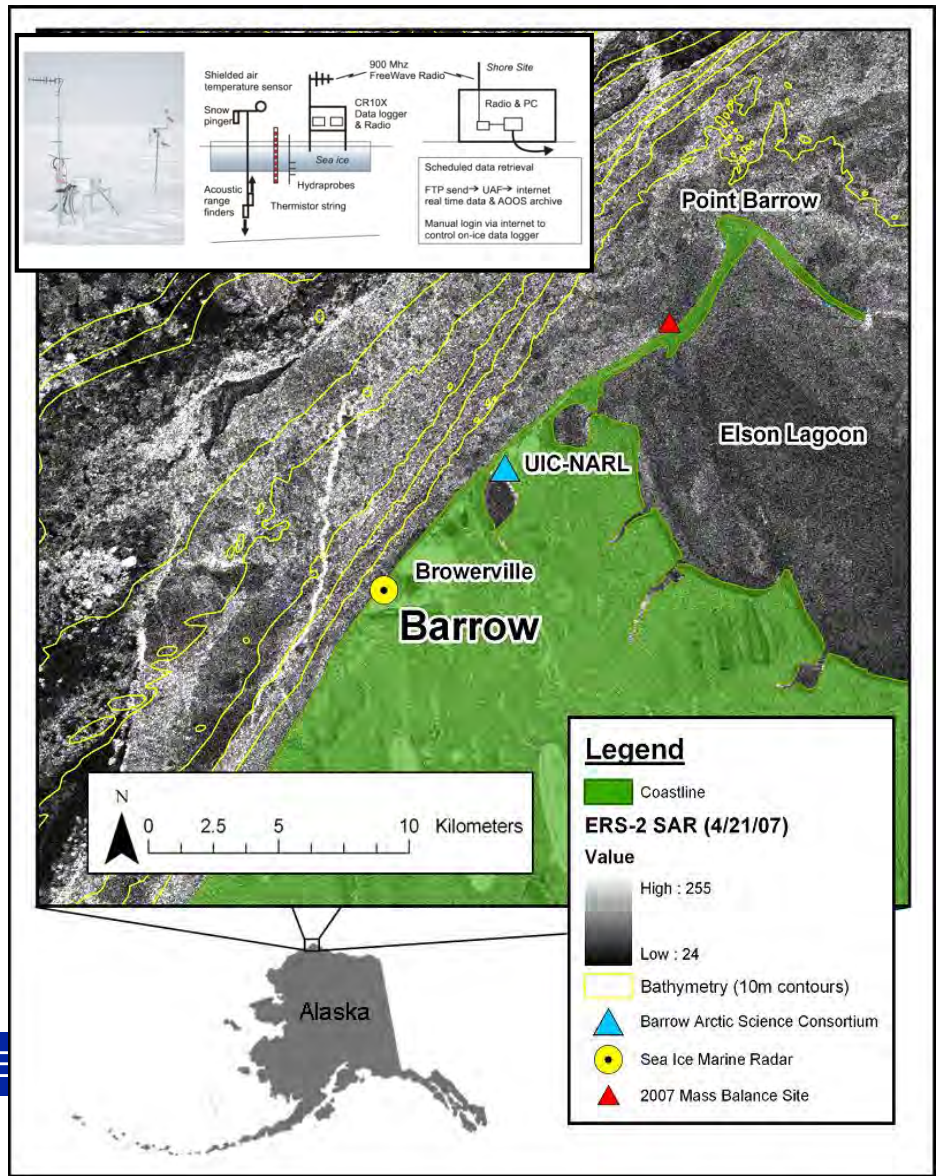
*Aerial surveys (including UAVs), ice & sub-ice sensor systems**

*Local knowledge**: Potentially important role for disaster response

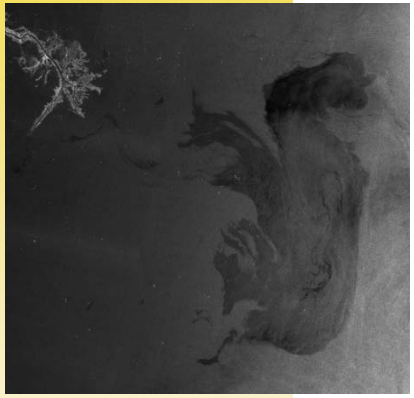
Integration of data streams, GIS-based decision support systems

* Leveraged through integration & assimilation of existing coastal observing system resources supported by NSF, DHS, and NOAA

Eicken, Petrich, Mahoney, et al.; www.sizonet.org



Long Term – Development of Operational, Multi-Sensor Capability



SAR

+

Multi-spectral

+

In-situ Observations and Modeling

↓↓

Automated spill map and predictions

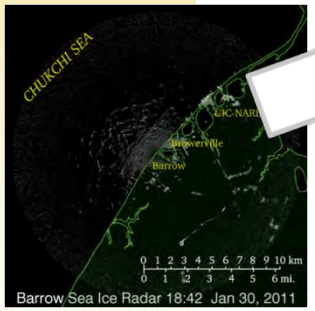
Capabilities:

- An operational capability for oil spill/slick detection and monitoring is possible given the great variety of commercial sensors available.
- Capability based on SAR data with multispectral data providing additional imagery, as available.
- Algorithms exist for detection, but need to be procured and integrated into an operational environment.

Limitations:

- Oil under ice is still a research area.

Oil Trajectory Modeling in Ice-Covered Waters



Monitoring

Predicting

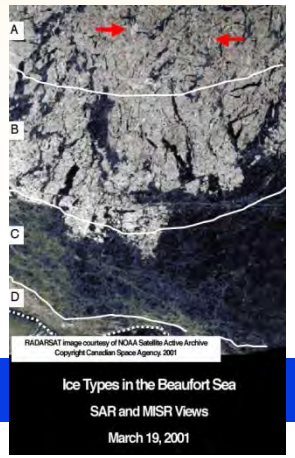
Evaluate the capability of current state-of-the-art sea-ice models to predict oil-spill trajectories

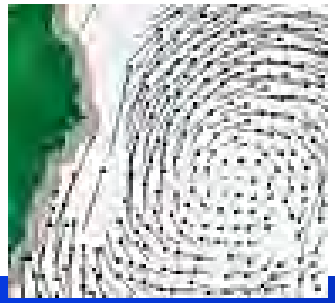
Identify key research areas to transition models to operations

Products

Daily to weekly forecasts for spill response and planning

Modeled oil-spill trajectories based on key spill scenarios for EIAs and risk assessments





Data Fusion and Display Capabilities

- Field responders need compiled and synthesized information, not just data.

- Available fields should include all critically relevant information sources, such as recent images of ice, overlays of winds, currents, plume extent, projections of trajectories…

- Should be open source and non-classified.

- Shared response requires shared awareness information that is authoritative and trusted. Need a common platform for diverse data and information to be accessible by all.

Study fish and wildlife health and linkages to human health, and human exposures.

- Fish and wildlife as contaminant pathways of exposure to humans (heavy metals, persistent organic pollutants, petroleum industry-related compounds).
- Adverse health impacts of these contaminants on exposed fish and wildlife based on gross, microscopic, biochemical and chemical measures.

R/V SIKULIAQ

A New Ice-Capable Asset For Arctic Studies

For more information:

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The SIKULIAQ allows researchers to collect sediment samples directly from the seafloor, hosts remotely operated vehicles, uses a flexible suite of winches to raise and lower scientific equipment, and conducts surveys throughout the water column and sea bottom using an extensive set of research instrumentation.

The ship is capable of transmitting real-time information directly to classrooms all over the world. The SIKULIAQ has accommodations for up to 26 scientists, marine technicians, and students at one time, including those with disabilities.

Characteristics

Overall Length	261 feet	80 m
Draft	18.9 feet	5.7 m
Beam	52 feet	16 m
Speed, Calm Open Water	14.2 knots	
Endurance	45 days	
Ice Breaking	2.5 feet at 2 knots	0.75 m
Scientist Berths	26	
Crew Berths	20	
Science Labs	2,100 square feet	
Science Storage Vans (8'x20')	2-4 vans	
Deck Working Area 3,900 square feet		
Fresh-Water Storage	13,190 gallons	
Water-Making Capacity	6,000 gallons/day	
Fuel Capacity	170,000 gallons	
Disability Accommodations Yes: labs, galleys, staterooms		

Summary

- Advancing technology to address oil spills in ice dominated waters.
- Preparing to reduce consequences of an oil spill, particularly for a vessel in innocent passage.
- Preventing an incident from becoming an accident through rigorous planning for disabled vessels.
- Reducing exposure to hazards via routing measures potentially including areas to be avoided.
- We need to work closely with our international collaborators to benefit from the knowledge that currently exists.
- Discussions such as this conference are critically important to share understanding and achievements.


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