# ARCTIC DOMAIN AWARENESS CENTER
## A DEPARTMENT OF HOMELAND SECURITY CENTER OF EXCELLENCE

# Arctic Domain Awareness Center (ADAC)

*A DHS Science and Technology Center of Excellence*

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## Research Areas
- Maritime Domain Awareness
- Maritime Situational Awareness and Response Support
- Maritime Technology Research
- Integrated Education

## University Partners
University of Idaho
University of Washington
University of Alaska Fairbanks
Maine Maritime Academy

## Institutional Partners
Woods Hole Oceanographic Institute

## Industry Partners
MDA Systems
GeoNorth
Lockheed Martin
AeroVironment
Spectronn
LSA Autonomy
Liquid Robotics
Robotic Technology
Port of Anchorage

## Community Observers
Native Village of Gambell

*Mission: To develop and transition technology solutions, innovative products, and educational programs to improve situational awareness and crisis response capabilities related to emerging maritime challenges posed by the dynamic Arctic environment.*

## Quick Facts
- Led by the University of Alaska Anchorage (UAA).
- Engages a consortium of 16 partners geographically distributed among a distinguished group of universities, research institutions, and industry leaders. Consists of experts in engineering and science, entrepreneurs experienced in technology transition, and experienced executives from private industry.
- Dr. Helena Wisniewski is ADAC's executive director and principal investigator. She also serves as Vice Provost for Research and Graduate Studies at UAA and President of Seawolf Holdings.
- Addresses DHS Science & Technology's visionary goal to enable the decision maker.
- Develops systems that systematically observe, assess, predict, and alert stakeholders of:
  - Arctic environmental changes;
  - Globalization changes;
  - Vessel movement;
  - Waterway use;
  - Incursion;
  - Arctic sea ice and storm surge;
  - Oil spills; and
  - Intentional and unintentional catastrophic events.
- Provides incident commanders with actionable information and decision support to respond to and prepare for current and future events of concern.

## Background
- Established by DHS in August 2014.
- UAA is the first institution in Alaska to lead a DHS Center of Excellence (COE).
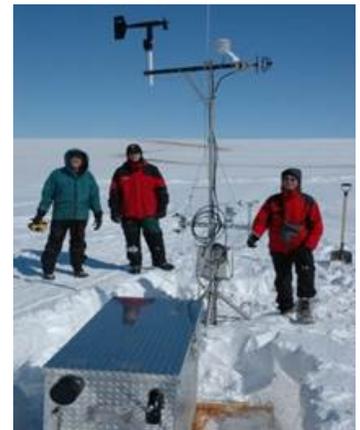
# ADAC Highlights

### Integrated Intelligent System of Systems (IISOS) for Maritime Situational Awareness and Response Support in Uncertain Arctic Environments

IISOS will improve situational awareness for maritime responders by integrating and analyzing data from ADAC developed remote sensors, event modeling, community based observer networks, databases, unmanned autonomous vehicles, and communication devices. It will provide incident commanders with actionable information to respond to intentional and unintentional catastrophic events. It will also provide predictive models that can be used for preparing and planning for such events. For example, it will enhance the U.S. Coast Guard's (USCG's) ability to prepare for and respond to oil spills in the Arctic Ocean, to more safely and reliably conduct search and rescue missions, and to support DHS efforts to prepare and plan for disasters caused by large coastal storms.

### Community Based Observer Networks (CBONS)

CBONS is integrating an indigenous knowledge-based approach with technology to systematically observe and document Arctic environmental and globalization changes – vessel tracking, incursions, and arctic sea ice. The initial location will be Alaska's St. Lawrence Island, which has demonstrated integration of community-based sea ice observations with the Arctic Environmental Response Management Application (ERMA) – a web based GIS tool for emergency responders. ADAC will expand on the existing CBONS framework and methodology to include additional observation categories and to incorporate unmanned aerial vehicles, remote sensing networks, and new communication devices.



*Village of Gambell on St. Lawrence Island in the Bering Strait - CBONS*

### Arctic Sea Ice and Storm Surge Modeling

This project is developing new real time higher resolution models for now-casting and forecasting of sea ice (e.g., concentrations, thickness, flow) and ocean currents in the North West passage that can be used to assist in navigation for search and rescue missions. Models will build on the Hybrid Coordinate Ocean Model developed by the U.S. Naval Research Laboratory, and the University of Washington's Marginal Ice Zone Modeling and Assimilation System. This will support DHS efforts to prepare and plan for disasters caused by large coastal storms and to more safely and reliably conduct search and rescue missions.

### Arctic Oil Spill Modeling

This project is developing a new General National Oceanic and Atmospheric Administration (NOAA) Oil Modeling Environment (GNOME) based oil spill response model to enhance capabilities to assess, predict, and monitor the effects and development of oil spills in the Arctic. The new model will provide real time high-resolution models that incorporate sea ice, temperature, ocean currents, and storm surges to enhance USCG's ability to prepare for and respond to oil spills in the Arctic.

### New Low-Cost Wireless Sensors for Arctic Monitoring

ADAC is developing low-cost, wireless sensors that do not require batteries for remote Arctic monitoring. These low power sensors can form ad-hoc sensor networks for remote vessel tracking, surveillance, and monitoring of climate change (e.g., ice flow, depth). These sensors can collect, transmit, and store data for long periods of time without external power. They can then transmit the data to unmanned aerial sensors or vessels of opportunity.