2021 | ISSUE 4

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

Center News

Quarterly Newsletter • December 2021

The Coast Guard Cutter Healy near Baffin Island in Canada in September 2021.
Photo By: Coast Guard Chief Petty Officer Matthew Masaschi/Retrieved from www.defense.gov

USCGC Healy Provides Data for ADAC Sea Ice Modelling Project

Observation data marks milestone for ARCTICE Project

By: Connor Keesecker; ADAC Communications and Research Associate

The voyage of the U.S. Coast Guard CGC Healy through the Northwest Passage this summer provided scientists with a significant opportunity to gather data on changing environmental conditions in the Arctic. One research project that benefited from the USCG mission was ADAC's Arctic Ice Condition Index, otherwise known as "ARCTICE." The ARCTICE model forecasts current and future ice conditions relevant to vessel capabilities for the Bering, Chukchi, and Beaufort Seas from 72 hours up to one month in advance. ARCTICE uses the partial sea ice concentrations from the High-Resolution Ice-Ocean Modeling and Assimilation System (HIOMAS), another ADAC project, to produce a map of the risk index outcome values across the Arctic Ocean. This information is communicated to vessel masters through an easy-to-understand numeral index that estimates the ability of the vessel to navigate the Arctic based on the vessel's icebreaking capabilities.

As the Healy traveled from Seward, Alaska, through the Bering Strait, and waters off the coast of the Alaskan North Slope, scientists with the U.S. National Sea Ice Center (USNIC) recorded observations on sea ice conditions. USNIC sent the data to Dr. Jifeng Peng, Principal Investigator for ARCTICE, and Supporting Investigator, Kelsey Frazier, who compared the field observations to the data produced by the ARCTICE model.

Up until now, direct sea ice observations by maritime operators have generally been unavailable in the U.S. Arctic. Therefore, the opportunity to leverage observation data from the voyage of the Healy this summer was important for validating the data produced by the ARCTICE model.

Overall, Dr. Peng and Ms. Frazier found that ARCTICE predictions for navigability matched the observed conditions reported by personnel on the CGC Healy. However, the team found that the model underestimated sea ice thickness in the marginal ice zone where ice presence varies seasonally between the coast and year-round ice pack. While this would not be an issue for U.S. Coast Guard's largest and most advanced icebreaker, this discrepancy reveals that vessels of a lower Polar Class could encounter ice too thick to navigate. While the model was less accurate for ships of the lowest Polar Class, the data output exceeded the accuracy percentage established in the performance metrics for the project.

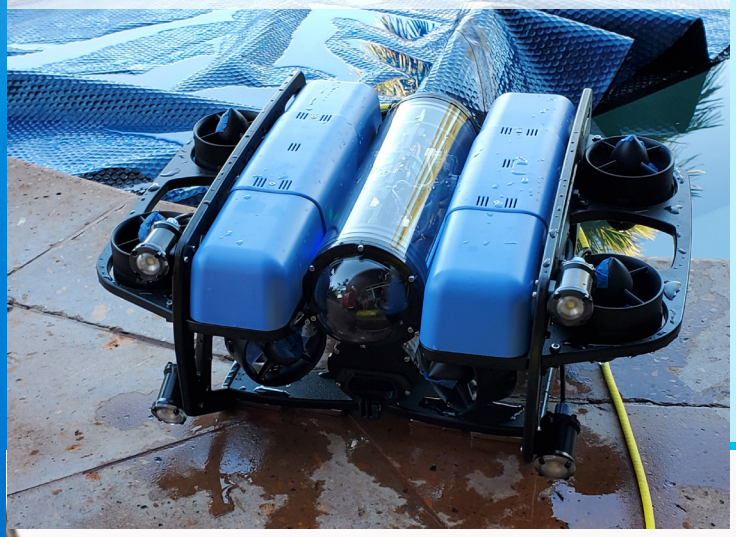
Ultimately, the observations demonstrated that the ARCTICE tool produces highly accurate predictions for higher Polar Class vessels. Through the use of these field observations, the ARCTICE team marked off an essential capstone for validating the ARCTICE model as a decision support tool for the Arctic maritime community. The tool is publicly available and is accessible online at https://arctice.srv.axds.co/.

ADAC's Education Program Comes Full Circle

By: Ellee Matthews; ADAC Education and Adminstrative Manager

A major goal of ADAC's Education Program is to provide students with skills and experiences that will continue to fuel successful career opportunities beyond their graduation from the Program. This year, one of ADAC's former fellows and Arctic Summer interns, Daniel Cruz, demonstrated the achievement of this goal. As an undergraduate Electrical Engineering student from the University of Texas El Paso (UTEP), Mr. Cruz participated in both ADAC's Fellowship Program and Arctic Summer Internship Program (ASIP) in 2019. Under the mentorship of Dr. Craig Tweedie, Mr. Cruz was involved in research projects based at the Barrow Arctic Research Center in Utqiaġvik, Alaska, that focused on remotely operated field sensors installed on the tundra.

A remotely operated underwater blueROV at the University of Texas El-Paso.



Following his graduation from the ADAC Fellowship Program as well as from his undergraduate degree in December of 2019, Mr. Cruz immediately began to pursue a master's degree in Computer Science at UTEP where he could continue to focus on remote sensors and operations. Now, well into his second year of his graduate degree, Mr. Cruz will once again be working with members of the ADAC team. This year, Mr. Cruz became the recipient of a prestigious fellowship with the National Oceanic and Atmospheric Association's (NOAA) Center for Earth System Sciences and Remote Sensing Technologies (CESSRST). The NOAA-CESSRST Education Program is a national leader in STEM workforce development, with a particular focus on NOAA's missions related to Earth Systems observations, monitoring through the use of environmental satellites, and ground-based remote sensing technologies. As a component of Mr. Cruz's NOAA-CESSRST Fellowship, he will participate in a 12-week summer internship for NOAA's Experiential Research and Training Opportunities (NERTO) Program in the summer of 2022. The specific placement chosen for Mr. Cruz's summer internship is none other than the Woods Hole Oceanographic Institute (WHOI) where he will be associated with ADAC's Long Range Autonomous Underwater Vehicle (LRAUV) Project.

While the specific project tasks that Mr. Cruz will conduct at WHOI are still being finalized, he will likely be applying his skills using remote operated vehicles (ROVs) to conduct research related to machine learning applications with digital sea holography images. Digital holography is an imaging technique that uses wavefront diffracted from on object. It is an ideal technique in sea environments, as well as in the field, as it provides a non-intrusive mechanism to capture 3-D images.

The ADAC team is delighted to see Mr. Cruz's affiliation with the Center come full circle as he transitions into his new summer internship at WHOI. We look forward to working with you again soon, Mr. Cruz!

Former ADAC Fellows Daniel Cruz, left, and Megan Verfaillie in the field for ADAC's Arctic Summer Internship Program in 2019

Environmental Risk Index: Virtual Assessment

How do you observe risk? The answer depends, of course, on the type of risk.

By: Kesley Fraizer; ADAC Research Associate

The Arctic Facilities and Infrastructure Environmental Change Risk Index project, called ERI for short, is tasked with developing a straightforward methodology for evaluating potential environmental risks (e.g.: permafrost thaw, coastal erosion, etc.) impacting coastal bulk fuel facilities in rural Alaska.

The complex regulatory nature of these facilities is overshadowed by the difficulties in reaching them. In the contiguous U.S., regulators might visit a fuel facility once a year, with representatives from EPA, USCG, state and other agencies. With a limited road system, the vast majority of facilities in Alaska are only reachable by plane. Plane services to each community are not guaranteed, and often require chartered flights, an added cost to an already expensive situation. However, if a fuel spill were to happen, clean-up would be more costly and difficult to manage.

To figure out what the potential risk of environmental impact could be, the ERI team hosted a two-day workshop on 29 and 30 September focused on risk to bulk fuel facilities. This workshop brought together community, commercial, academic, state, and federal partners to discuss how the changing climate impacts bulk fuel facilities in coastal Alaska. The workshop was open to the public on day one, followed by closed-door discussions on day two specific to USCG procedures and operations. The outcomes included a better understanding of prior work completed, better awareness of USCG inspector needs for using the index, and critical knowledge about what factors can and cannot be observed on the ground. The ERI team continues to advance their risk index work through March 2022, when the first phase of the project is completed.

Learn more about the impact of the Center's research through ADAC Project Summaries

Since 2014, ADAC has developed technology solutions, innovative products and performed fundamental research to support Federal stakeholders, Arctic operators, and the public good. Learn more about the impact of ADAC's current and completed research projects through our new ADAC Project Summaries on the ADAC website. The collection features a condensed summary of all current and completed research projects, detailing their impact on the Center's principal customer, the U.S. Coast Guard, as well as the public good. Over eight program years, ADAC has been honored to host a prestigious collection of dedicated researchers and Arctic stakeholders from across the United States who continue to advance our understanding of the Arctic and provide technology solutions for the challenges present in the High North. Read more about ADAC's research outcomes on the ADAC Website. Further information on ADAC projects can be found on the ADAC Projects Page.

ADAC Center Update

Happy Holidays from the ADAC Team

By: Jeff Libby; ADAC Executive Director

I want to take a moment to wish everyone Happy Holidays and all the best for a prosperous New Year. The ADAC team truly appreciates all of your generous support over these past seven plus years. The Center's success is in large part due to your time and contributions and I want to thank each and every one of you.

These past few months have been eye-opening for me in regards to the expansive network of ADAC supporters and the individuals actively involved in all of the Center's activities. We are fortunate to report that we still interact on a regular basis with our beloved previous Executive Director, Randy "Church" Kee, Maj Gen, USAF (Ret) and wish success to him and the Ted Stevens Center for Arctic Security Studies. The University and the ADAC team look forward to a long partnership with him and his new endeavor. Additionally, I have been privileged to meet many of you virtually and at a few in-person meetings despite the looming pandemic. For those of you I have not met with, I am sincerely looking forward to the opportunity to interact and discuss ADAC's future trajectory and want to thank you for your patience. With that said, here are some highlights since the last quarterly newsletter:

The Arctic Facilities and Infrastructure Environmental Change Risk Index project held its workshop and also had the distinguished opportunity to meet and discuss the project with Dr. Victoria Hermann. Dr. Hermann is White House Fellow who previously served as the President and Managing Director for The Arctic Institute, but is on sabbatical completing this fellowship. Special thanks to Dr. Hermann and our friends and colleagues at USCG District 17 and Sector Anchorage for inviting ADAC to participate.

The ADAC team participated in the Maritime Risk Symposium where ADAC Fellow Tori Sweet took 3rd place for her poster presentation on the Arctic Oil Spill Modeling project.

ADAC's Kelsey Frazier provided a brief presentation to the Arctic Council's Working Group for the Protection of the Arctic Marine Environment (PAME) regarding our current ARCTICE project. Special thanks to Arctic Council and this network for their interest and support of projects and operations at ADAC.

ADAC personnel both in Anchorage and Fairbanks were fortunate to host the USCG MER team to discuss and tour facilities for the project entitled Photo-enhanced toxicity of dispersed and burned crude oil to Arctic mussels and in Fairbanks the team was able to learn about the Remote Unmanned Aircraft System (UAS) inspection and Response Team Development in the Bering Strait Region and have a day filled of activities and site visits.

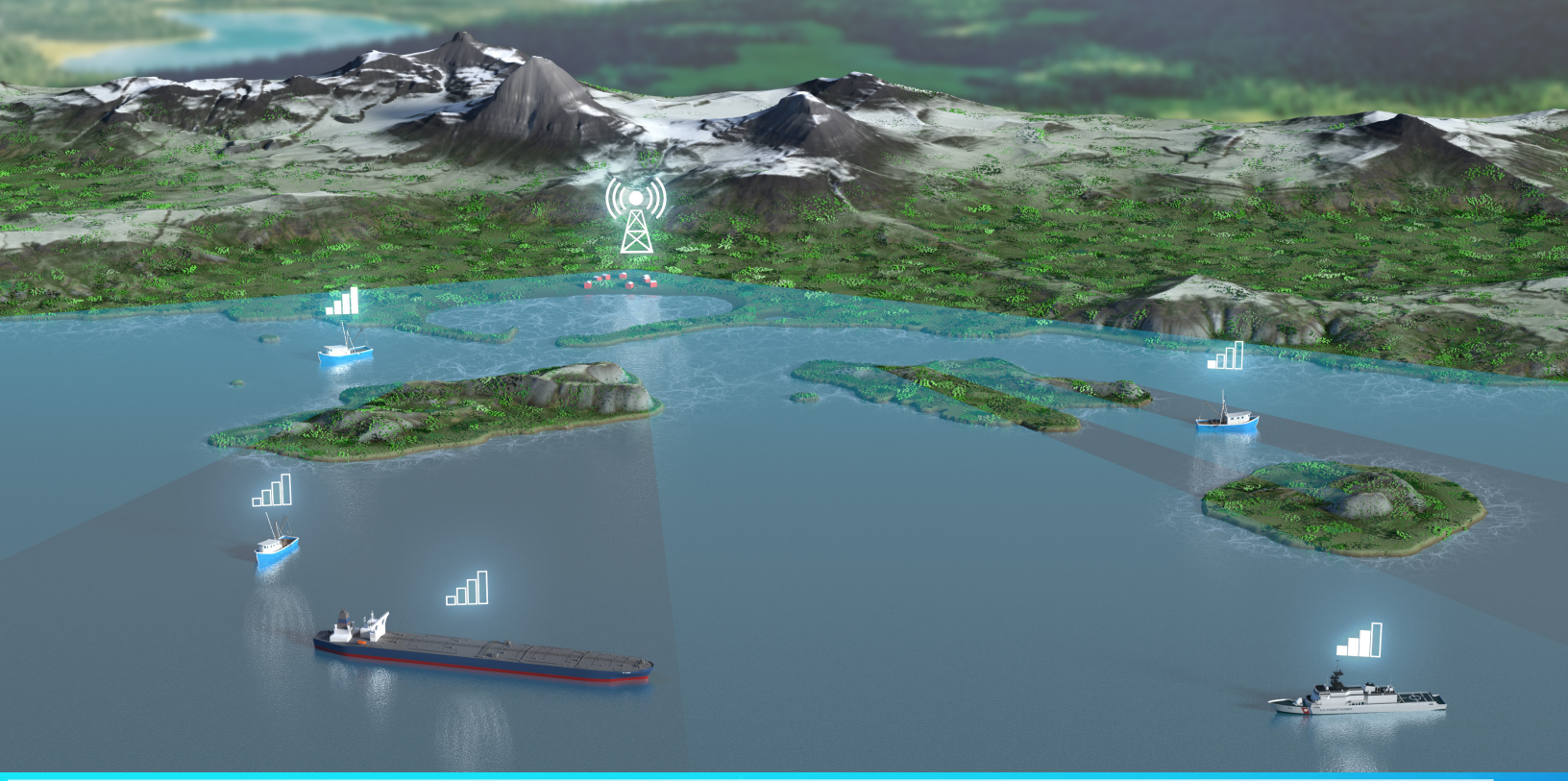
Additionally, ADAC met briefly with our partners at the North American and Arctic Defense Security Network (NAADSN) at Trent University in Ontario and would like to inform everyone that ACCUSARS III will be held February 17th and 18th. More information is coming and a link for registration will soon be available on the ADAC website.

With all the activities of the Center, the question I am asked the most is "What is next for ADAC?" As many of you know, the ADAC family is extremely busy concluding research projects, writing reports, and exploring technology transfer opportunities as our base funding ends this year in June 2022. However, while the base funding may no longer be available, the Department of Homeland Security, Science and Technology, Office of University Programs has awarded the University of Alaska Anchorage a Basic Ordering Agreement (BOA). This BOA allows entities to fund projects (past, present, or future) for further development and research without having to go through the normal burdensome contracting process. If you are interested in how you can support an ADAC initiative, project, or endeavor further, I would be happy to discuss how the BOA works in more detail. In addition to the BOA, the ADAC leadership team is actively seeking alternative funding avenues, reviewing solicitations and submitting grant proposals. The team has experienced some success in finding additional funding through these pathways. As the new ADAC Executive Director, I am asking for your assistance and challenging you to help us continue ADAC's legacy as an Emeritus Center. If you're aware of other opportunities that could support our mission to continue please let me know. I welcome any and all suggestions.

Thank you again for all of your support, wishing you all time to enjoy the holidays with friends, family and loved ones.

Happy holidays,

-Jeff



Upcoming ADAC Survey on Arctic Maritime Communications and Connectivity

Survey feedback will assist Federal stakeholders with planning communications and connectivity strategies

By: Jason "Olaf" Roe; ADAC Associate Director and Senior Research Professional

When discussing the challenges pertaining to the Alaskan and Arctic maritime operations, several unique defining factors including the extreme environment, great distances, and limited infrastructure tend to occupy a large part of the conversation. Extreme environmental conditions routinely push communications equipment beyond intended operational specifications and harsh conditions significantly shorten equipment service life. Great distances and sparse population densities often necessitate point-to-point communications over several hundreds or thousands of miles in areas with severely limited satellite coverage or other supporting infrastructure. Limited infrastructure also greatly limits system redundancy and increases the frequency and severity of system outages.

The 2019 USCG Arctic Strategic Outlook describes Alaskan and Arctic communications and connectivity through the following: "The high latitudes suffer from poor propagation of radio signals, geomagnetic interference, scant landside infrastructure, and limited satellite coverage and bandwidth. Some Arctic communities have cellular phone networks, but these are often constrained by limited coverage, capacity, and reliability. Closing the communications gap is a whole-of-government challenge and will require intensive partnerships across the interagency, industry, and the international community, as well as the State of Alaska and Alaska Native communities."

It is generally understood that Arctic operators routinely adapt communications equipment, methods, and internal processes to overcome the significant demands imposed by the unique Alaskan and Arctic operating environment. Through the years as Alaskan and Arctic mariners have developed increasingly innovative solutions to reduce communications shortfalls and meet their needs. Federal maritime communications stakeholders have become cognizant that a better understanding of the communications and connectivity solutions employed in Alaska and the Arctic is needed.

As such, developing a more comprehensive understanding of the current and future needs of mariners will help better align future regulatory requirements, infrastructure support, and adoption of future communications methods that most effectively serve the Alaskan and Arctic Maritime community.

To assist with this endeavor, ADAC's Alaskan and Arctic Maritime Communications and Connectivity Analysis (AAMC&CA) Project is currently underway in developing a survey of the Alaskan and Arctic Maritime community. It is the project teams' goal that through this survey, communications program planners and regulatory bodies will have an increased understanding of the operational needs and challenges of high latitudes operators, and can better plan for the future. Information on the AAMC&CA project can be found here: https://arcticdomainawarenesscenter.org/P30_AAMCCA

ADAC Website

To stay up to date on ADAC events, posts, documents, and projects, be sure to visit us at: https://arcticdomainawarenesscenter.org/

Upcoming Events

Please see details for ADAC hosted events at: https://arcticdomainawarenesscenter.org/Events

Advancing Collaboration in Canada-US Arctic Regional Security III (ACCUSARS III) 17-18 February 2022. ADAC and the North American Arctic Defence and Security Network (NAADSN) will host the third ACCUSARS event focused on the Eastern North American Arctic Regions. Further details to be annouced.

Arctic Symposium 2022. 3-6 May 2022. Alaskan Command Arctic Symposium 2021 was postponed to 2022. On behalf of USNORTHCOM, US Alaskan Command invites defense and security professionals to Arctic Symposium. Further details to be annouced.

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

ADAC's Mission

The Arctic Domain Awareness Center, led by the University of Alaska, develops and transitions 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.

UNIVERSITY of ALASKA
Many Traditions One Alaska

Contact Information

Website: ArcticDomainAwarenessCenter.org
Email: uaa.adac@uaa.alaska.edu

3211 Providence Dr.
BOC3 Suite 120
Anchorage, AK, 99508

@ADACAlaska

@ADACAlaska

YouTube
Arctic Domain Awareness Center

This material is based upon work supported by the U.S. Department of Homeland Security under Grant Award Number 2014ST-061-ML0002. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Department of Homeland Security.