2020

A YEAR IN REVIEW

International Arctic Research Center

UNDERSTANDING THE ARCTIC TO MAKE A DIFFERENCE

Students from McGrath School snowmobiled to a local lake to take measurements for the Fresh Eyes on Ice project. Learn more on pages 8–9.

MESSAGE FROM THE DIRECTOR

Early in 2020 IARC hosted a delegation from Japan to explore Arctic collaboration opportunities between our two countries. A few weeks later the novel coronavirus pandemic emerged as a global threat and put a halt to in-person meetings. IARC staff and researchers have shown remarkable strength and stamina in weathering this crisis. Our communications team pointed the way in March: They had less than three weeks to help transform the Arctic Observing Summit from an in-person conference in Iceland to a successful and engaging online meeting with over 300 participants (page 14).

The Arctic Observing Summit links the work of observing program leads such as Igor Polyakov, who had a most remarkable year featured in the pages of this report (page 6–7), to those in Arctic communities experiencing and responding to changes on the ground. Donna Hauser's work (page 8–9) illustrates discoveries and responses at the interface between university research and Indigenous Knowledge.

To develop new opportunities and help us squarely face challenges, IARC has embarked on a strategic planning effort. One aspect highlighted by this work is the importance of researchers and staff pulling together to jointly develop a vision that further strengthens our institute's unique role and capacity. IARC's Diversity, Equity and Inclusion Working Group led by Elena Sparrow and Mimi Lesniak has been a key guiding light to help us find our way.

Finally, it's exciting to see IARC's Katie Spellman and Kristin Timm selected as inaugural Faculty Fellows to help lead the UAF Honors College Climate Scholars program (page 17). Their building bridges between research and education, climate science and community response is timely and points the way towards a bright future for this type of work.

The researchers and staff highlighted in this report are just a few of an outstanding roster of thinkers and doers at IARC. All of them work hard to make a tangible difference in advancing fundamental and actionable science in a rapidly changing Arctic— please see for yourself and get in touch if you want to work with us!

Hajo Eicken
IARC Director
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Contents

Comments/questions

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Authors

Heather McFarland, Mike DeLue

Review

Hajo Eicken, Igor Polyakov, Katie Spellman, Chris Arp, Nancy Fresco, Nathan Kettle, Uma Bhatt, Donna Hauser, Alex Whiting, Tina Buxbaum, Mike DeLue, Carolyn Rosner

What we do

We are the International Arctic Research Center (IARC) on the University of Alaska Fairbanks Troth Yeddha' Campus. Our purpose is to understand the Arctic to make a difference. These six core values guide our research:

Useful, actionable science

Our research responds to society's needs in a changing Arctic and world.

Deeper understanding

Our emphasis on fundamental research sets the groundwork for understanding and responding to Arctic change.

Grounded in place

Living and working in Alaska, gives us an holistic knowledge and understanding of the Arctic. We value what the North and its people teach us.

Inclusion and diversity

We actively cultivate an environment where all individuals and groups feel welcomed and heard. Our different experiences, expertise, and ways of knowing are our strength, creating diverse thoughts and ideas.

Innovation and expertise

Drawing on our expertise, we value a culture of creativity that fosters innovation.

Collaboration

We solve problems through local to international collaboration with different disciplines, knowledge systems, and by engaging with government agencies.

Kodiak National Wildlife Refuge

WILDFIRE OUTLOOKS

USEFUL & ACTIONABLE SCIENCE

Prediction tailored to the North

The rapidly changing North demands new weather prediction and climate products. The Experimental Arctic Prediction Initiative brings together forecasters, climatologists, social scientists and stakeholders to find new ways to predict weather events tailored to the specific needs of people living and working in the North.

The initiative focuses on the seasonal and subseasonal prediction niche. "The National Weather Service has a handle on short term forecasts. There is also a tremendous amount of projections of long term change," explained social scientist Nathan Kettle and EAPI's science lead. "But EAPI has a focus on these subseasonal and seasonal predictions. That's really an area that is ripe for innovation. And it's an area of articulated need by stakeholders."

Although there is demand for forecasts months in advance, it is challenging to make predictions over these timescales. It is also difficult to forecast processes that cut across different components of the environment (e.g., related to wildfires, coastal hazards, infrastructure threats). EAPI has the disciplinary breadth, and scientific and technical skills to meet the needs of wildfire managers looking for seasonal lightning forecasts, the US Navy predicting sea ice movements for under ice submarine exercises, Bering Sea crabbers forecasting the ice edge location, or Alaska Division of Geological & Geophysical Surveys exploring landslide potential in southeast Alaska.

Social science strength

With Kettle at the helm, EAPI is strategically designed to ensure that user needs remain at the center of every prediction product. As a social scientist Kettle's role is to pair forecasts with users. He partners with Arctic operators, communities and decision-makers to identify their needs, and works alongside them to assess and improve products as they are developed.

"Physical or environmental scientists without social science training tend to jump too quickly to solve the scientific problem aspect of prediction rather than first eliciting information and guidance from the decision-makers and users of forecasts that provide critical context," explained Hajo Eicken, director of IARC.

"It's the latter that is the bottleneck and while interesting approaches to prediction make it into the scientific literature that does not at all guarantee that those approaches are actually useful in practical settings."

Leveraging this social science strength with the scientific and technical know-how of modelers and forecasters, EAPI builds capacity in ways that are different from many other prediction efforts.

EAPI's science lead Nathan Kettle.

Working with fire managers

EAPI has a strong partnership with Alaska's wildfire community. Working with other university partners like the Alaska Fire Science Consortium, they identified that better seasonal fire prediction was the top request by Alaska wildfire managers to the science community.

Months before Alaska's first wildfire, managers make decisions about the coming season. When crews should be hired? Which regions likely need more resources like water scooping aircraft?

Seasonal fire outlooks can help inform these decisions, but past products did not show much predictive skill in Alaska's unique environment.

Wildfire Build-Up Index

During the wildfire season, managers use a tool called the Wildfire Build-Up Index to assess wildfire danger based on fuel wetness or dryness. In the past, managers were only able to use the index to predict fire activity a few days out. Now, EAPI is helping managers predict the index months before the coming fire season. Predictions for May–September are provided in March and split into intervals and regions relevant to the fire community.

This seasonal outlook of the build-up index allows managers to plan resources and personnel months in advance. At the end of the fire season, scientists and managers work together to assess how well the index performed, and improve predictions for the coming years.

How does it work?

EAPI's Uma Bhatt and graduate student Cece Borries-Strigle construct the outlook of the Build-Up Index using seasonal weather forecast models. They explored how the index varied under past known weather and climate conditions. It was then a game of adjustments to fine-tune the outlook. Where the model predictions were consistently too wet, or too hot, the model was corrected to account for the difference. Even with these adjustments, predicting the index three-months in the future continues to be difficult.

The model accuracy is frequently improved as the EAPI prediction team better understands how slowly varying parts of the climate system (e.g. sea surface temperatures, sea ice) contribute to Alaska fire weather.

BLM Alaska Fire Service

A NEW ARCTIC OCEAN

DEEPER UNDERSTANDING

Documenting a new ocean

"In many respects, the Arctic Ocean now looks like a new ocean," said IARC's Igor Polyakov. The changes go far beyond sea ice loss. The structure of the water column itself is altered, currents are shifting, and rivers are contributing more heat than ever before. This new ocean has both winners and losers. Some areas will become more biologically productive, while loss of ice and warmer conditions are threatening species that specialize in the cold and dark.

Polyakov helped document the shifts in a series of new publications.

More like the Atlantic & Pacific oceans

One source of the changes is an unusual influx of water from subarctic seas that makes the Arctic Ocean more like the Atlantic and Pacific oceans. This "borealization," as Polyakov calls it, is experienced differently on the Eurasian than on the American side.

Cold and relatively fresh water floats at the surface of the Arctic Ocean. Transition from this surface layer to the deeper water masses (this transition layer is called the halocline) inhibits strong vertical mixing which blocks the warmth from the deeper ocean, protecting sea ice from melting from below.

On the Eurasian side, that is changing. Warm, salty Atlantic water destabilizes the water column, making it more susceptible to mixing. The cool, protective halocline layer is now only about 260 feet deep, compared to 490 feet in 2003. Sea ice is now more vulnerable to heat from deeper in the ocean. As deeper, nutrient-rich water reaches the surface, the ocean also becomes more biologically productive.

By contrast, on the American side increased influx of warm, relatively fresh Pacific water, along with local processes like sea ice melt and river inputs, makes the separation between the surface and deep layers more pronounced. As the pool of fresh water grows, it limits mixing and the movement of nutrients to the surface, potentially making the region less biologically productive.

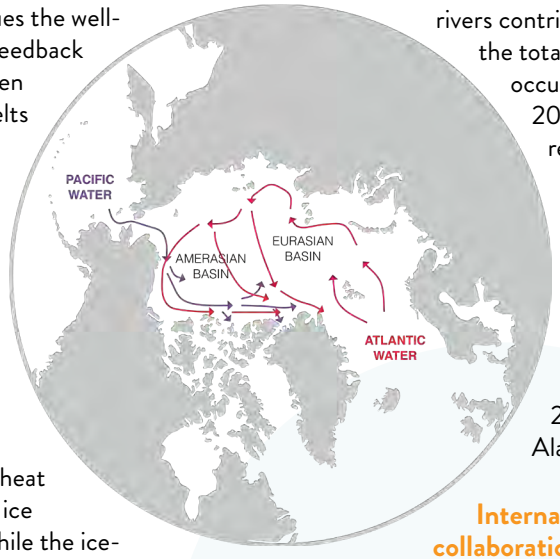
Winter ice growth limited

Polyakov explored how the weakening and thinning halocline on the Eurasian side limits winter sea ice growth.

He found that warm interior water that mixes with the upper ocean in winter prevents almost three feet of sea ice from forming each year. Previous measurements were about half that.

Bureau of Ocean Energy Management

Polyakov and his team hypothesize that the ocean's ability to control winter ice growth creates a feedback that speeds overall sea ice loss in the eastern Arctic. The mechanism magnifies the well-known ice-albedo feedback — which occurs when the atmosphere melts sea ice, creating open water, which in turn absorbs more heat, melting more ice.



When these two feedback mechanisms combine, they accelerate sea ice decline. The ocean heat feedback limits sea ice growth in winter, while the ice-albedo feedback more easily melts the thinner ice in summer. Through these mechanisms, the coupling between the atmosphere, ice and ocean is much stronger than it was before.

Stronger currents

This new pairing between the ocean, ice and atmosphere is also responsible for stronger currents in the eastern Arctic Ocean.

Polyakov and his colleagues found that between 2004–2018 the currents in the upper 164 feet of the ocean doubled in strength. Loss of sea ice, making surface waters more susceptible to the effects of wind, appears to be one of the factors contributing to the increase.

The stronger currents create more turbulence, which increases the amount of mixing between surface waters and the deeper ocean. As described earlier, ocean mixing contributes to a feedback mechanism that further accelerates sea ice decline.

Warming Arctic rivers melt sea ice

Subarctic seas aren't the only water bodies adding heat to the Arctic Ocean. Polyakov found that heat from major Arctic rivers contributes up to 10% of the total sea ice loss that occurred from 1980 to 2015 over the shelf region of the Arctic Ocean.

That melt is equivalent to about 120,000 square miles of 3.2-foot thick ice. That is roughly 20% the area of Alaska.

International collaboration

Piecing together the complex stories of Arctic Ocean change is not the responsibility of lone scientists or a single nation. It requires collaboration across disciplines and international coordination, especially among the eight nations that ring the Arctic Circle. That's where Polyakov shines. Since 2002 he led twelve multidisciplinary expeditions, called the Nansen and Amundsen Basins Observation System, into the Arctic Ocean. Scientists from thirteen nations participated.

With hundreds of thousands of data points gathered, summarizing the findings was no easy task. A sabbatical year at the Finnish Meteorological Institute was just the inspiration that Polyakov needed to coordinate and develop a more cohesive picture of the new Arctic Ocean. In rapid succession following his return, Polyakov produced five lead author publications and nine co-authored publications.

SEA ICE & UGRUK

Hunting *ugruk* is like hunting ice

According to Indigenous Elders in Kotzebue, Alaska, hunting *ugruk* (bearded seal) is like hunting ice. *Ugruk* are so closely tied to specific sea ice conditions, that when you find one, you often find the other. So, what happens to *ugruk* and Indigenous hunters as Arctic sea ice disappears? That's a question that IARC scientist Donna Hauser and Alex Whiting from the Native Village of Kotzebue are trying to uncover.

Their work is part of Ikaaġvik Sikukun – a research project in Kotzebue, Alaska that connects the community with scientists to understand how sea ice, ocean physics and marine mammals are changing. The project is guided by an Elders Advisory Council.

Past hunts

Ugruk enter Kotzebue Sound in spring searching for abundant fish, shrimp and clams. As the only major estuary north of the Bering Strait, the Sound provides a productive nearshore environment where *ugruk* restore fat reserves before continuing their migration north. While in the Sound, Indigenous hunters harvest *ugruk* for food and clothing.

In the past, Kotzebue Sound was reliably covered by near-continuous sea ice from January–April. *Ugruk* accessed the Sound through leads (linear openings in the ice) as the ice broke up, usually in May. Inside the Sound, persistent "white ice" floes made ideal feeding, molting and resting habitat. Even into July, Indigenous hunters targeted these floes to find *ugruk*. Because there was so much sea ice available, *ugruk* were usually spread out. Hunters searched for days, traveling far from Kotzebue and navigating through complex networks of ice floes.

Kotzebue Elder Ross Schaeffer harvests a seal. Schaeffer is on the Elder Advisory Council that partners with Ikaaġvik Sikukun.

Sarah Betcher
Farthest North Films

Co-production approach

Today sea ice conditions in the Sound are very different, requiring hunters to adjust. To better understand these changes, Hauser and Whiting co-produced research with Ikaaġvik Sikukun's Indigenous Elder Advisors and multidisciplinary scientists. They brought together three unique sources: Tribal records, Indigenous Knowledge and satellite images.

In 2002, Whiting began making weekly observations of weather, travel conditions, wildlife and fish, and hunting and fishing in Kotzebue. These Tribal records, gathered as part of Whiting's role as the Environmental Program Director for the Native Village of Kotzebue, became a baseline for comparing how *ugruk* hunting activities have changed.

Knowledge from the Indigenous Elder Advisors revealed the relationship between sea ice, *ugruk* and *ugruk* hunters. Like *ugruk*, Indigenous hunters need specific ice conditions to be successful. To avoid shooting *ugruk* in the water and risk having them sink, hunters prefer harvesting *ugruk* that are hauled out on ice floes. To access the floes, Kotzebue hunters wait until a channel in the ice from the Noatak and Kobuk rivers opens in front of town and boats can launch. To make hunting safe and affordable, the "white ice" floes where *ugruk* congregate need to be relatively close to town.

The final piece of the puzzle came from the satellite record. The team examined almost 20 years of satellite images, searching for past ice events that the Elders said were important to *ugruk* and hunters. For each spring, they found the date when *ugruk* could likely enter the Sound, when Kotzebue hunters could likely launch their boats, and when "white ice" floes disappeared.

Shorter hunting season

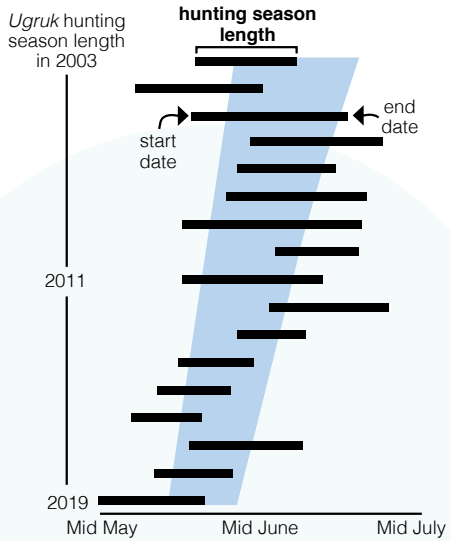
According to the study, over the past 17 years, the length of Kotzebue's spring *ugruk* hunting season decreased nearly one day per year. While hunters are not necessarily able to begin hunting any earlier, the season ends in mid-June rather than early July. This means that the hunting season is 26 days shorter than it was in 2003.

Earlier sea ice break up is the primary culprit for the shrinking hunting season. The satellite images showed that ice floes disappear from the Sound about 22 days earlier than they did in the past.

Interestingly, harvest success has not changed significantly. The type of hunting experience, however, has shifted. With less ice, hunters typically embark on shorter, more frequent trips. *Ugruk* too have changed their behavior. They often congregate together on the scarce ice floes.

2019, a year unlike the rest

In some years these sea ice changes make it easier to hunt *ugruk*. For example, in



Graph shows the change in *ugruk* hunting season length in Kotzebue, Alaska from 2003–2019.

2019 even though there was little sea ice in Kotzebue Sound, the available floes were near Kotzebue and many *ugruk* aggregated on them. Harvest effort was low, and success was high. But locals worry that in the future, the few available floes might be more difficult to find. In those scenarios hunters would need to travel in small boats, far across open water, searching for ice. It could be a needle in a haystack and harvest success would be lower and risk to hunters higher.

Learn more at ikaagviksikukun.org.

INCLUSION & DIVERSITY

FRESH EYES ON ICE

Falling through the ice for safety

As Alaska warms, the number of fatalities from falling through ice is expected to increase. That's what prompted scientist Chris Arp to purposefully fall through river ice on a 10°F November day. He then demonstrated how to self rescue, all while describing the experience to Alaska educators watching virtually on Zoom.

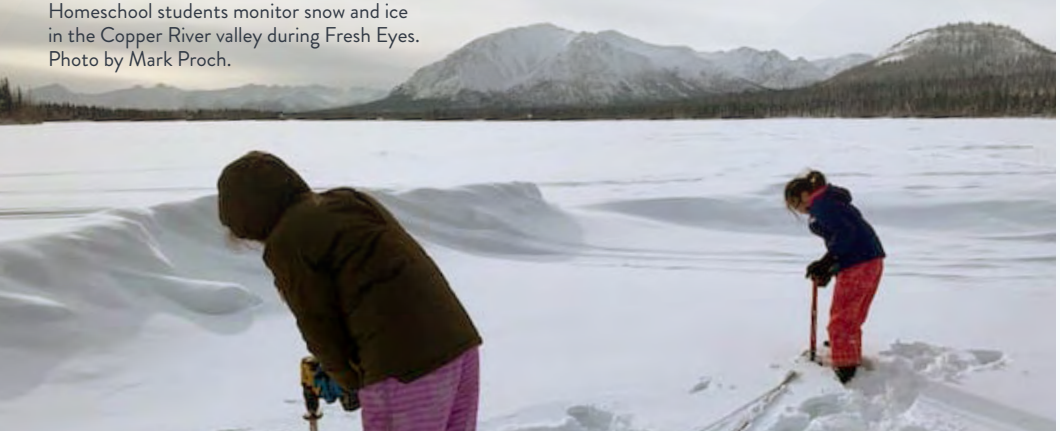
The exercise was part of IARC's Fresh Eyes on Ice, a lake and river ice-monitoring project that gets kids involved in science while promoting ice safety and a better understanding of changing winter conditions. Arp, who is part of UAF's Institute of Northern Engineering, leads the effort along with several individuals at IARC.

Fresh Eyes on Ice is an observing network that partners with community-youth groups and citizen scientists to gather ice data across the state. So far, 13 communities are participating, from Noatak and Bethel in the West to Arctic Village in Northeast and Kenny Lake in the South. An additional 300+ individuals share ice observations and information online.

Young scientists fill gaps

Each month, weather permitting, youth groups and educators travel to local river or lake monitoring sites to collect snow and ice thickness data. The young scientists learn to use scientific equipment and travel on ice safely. Their efforts fill big data gaps since Alaska's river and lake ice is too expansive for scientists to study alone. "We need fresh eyes on ice," said Arp playing off the project's name as he emphasized the important contribution citizen scientists can make. By collaborating with the GLOBE project, some of the snow measurements will also be used by NASA to validate data collected by satellite sensors.

Participation looks different at each site. The entire McGrath school is involved and the many community members have joined field trips to their study lake. They shared photos on the Fresh Eyes on Ice Facebook group of a long line of snowmobiles and tow-behind sleds transporting the eager young scientists. Meanwhile in Nenana, Aiden Coy and Ryan Chaney, both high school students at Nenana City School, are leading their own site. Coy, who had participated in IARC's Winterberry citizen science project, was motivated to join Fresh Eyes on Ice because his family has had frightening experiences with changing ice conditions. Homeschool families added several sites in the Copper River valley providing considerable data and enthusiastic dedication to science.



Homeschool students monitor snow and ice in the Copper River valley during Fresh Eyes. Photo by Mark Proch.

Left: Anne Wien Elementary School students record ice data at their Fresh Eyes on Ice site at Noyes Slough in Fairbanks. Photo by Jenn Wallace. **Right:** A McGrath student drills through the ice while on a Fresh Eyes on Ice monitoring field trip. Photo by Shelborne Christopher.

Covid-19 changed plans

Like many research efforts across Alaska, covid-19 changed things for Fresh Eyes on Ice. The science team had originally planned to traverse the state by snowmobile, gathering ice data at critical lakes and rivers, and visiting project participants. Their expedition was cut short. Instead, after a 14-day quarantine, they spent just two weeks on the Tanana River visiting only one community group. They took detailed measurements of ice where there was open water earlier in the year. This data may help explain how ice forms and changes at potentially hazardous sites.

In a surprising twist, covid-19 opened the door for more frequent interactions with educators. Laura Oxtoby and IARC's Katie Spellman, who are responsible for the education component of the project, lead monthly virtual check-ins, sharing ice information, demonstrating potential classroom activities and highlighting different ice observations. Educators can receive three continuing education credits by participating. This shift to virtual helped strengthen the network and build stronger personal relationships between scientists, participants and federal and state agencies who support the network and/or use the ice observations.

Studying how youth engage

In addition to studying ice, Fresh Eyes on Ice is exploring the science behind how youth engage while participating in research. Spellman and Oxtoby will test differences in learning when 1) scientists set the question and communities contribute data, compared to when 2) communities decide what to study based on local needs and curiosities, and scientists help design a study to address that question. Community participants are already participating in the first form of research, soon they will transition to developing their own local scale ice-related projects. Spellman and Oxtoby will explore how student learning and engagement differs between the two prongs of Fresh Eyes on Ice research.

Learn more at fresheyesonice.org.

GARDEN HELPER TOOL

A tool for farmers and gardeners

A recent web tool from IARC's Scenarios Network for Alaska + Arctic Planning makes data for agricultural planning in Alaska more accessible.

SNAP's Alaska Garden Helper shows gardeners and farmers the on-the-ground effects of future climate shifts.

The easy-to-use tool allows individuals to investigate their specific communities, from Ketchikan to Utqiaġvik. They can explore projected changes in growing season length, annual minimum temperature and hardiness zones.

The tool also provides graphs of the expected change in growing-degree days, a measure of cumulative heat energy available for the growing season and a critical variable for some crops.

Building the tool

Nancy Fresco, network coordinator at SNAP, led development of the Alaska Garden Helper. SNAP created the tool in collaboration with the Alaska Climate Adaptation Science Center and the U.S. Department of Agriculture. Fresco also worked with researchers from UAF's Department of Natural Resources and Environment, the Alaska Peony Growers Association, farmers in the Fairbanks area and skilled climate modelers.

The goal wasn't solely to produce a practical tool for gardeners, explained Fresco.

"None of us are under the impression that agriculturalists in Alaska are currently planning their planting seasons as far out as 2099," said Fresco. "We also wanted to put the effects of climate change into a practical context for people, and to empower people with the full dataset that our scientists work with."

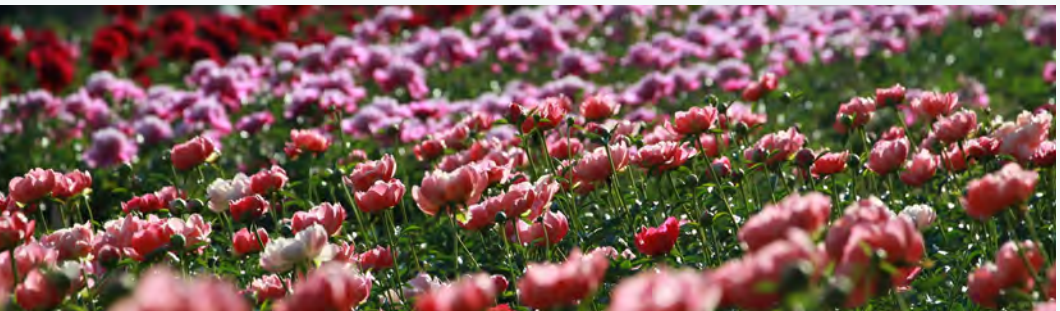
Climate change will likely affect each crop differently. Earlier planting seasons, greater accumulations of growing-degree days, and fewer cold-limiting temperatures are expected. Some changes are already taking place, for example, warm weather crops are increasingly available at local markets. "Fairbanks residents can now buy several varieties of cold-tolerant apples at the local farmers' market," shared Fresco.

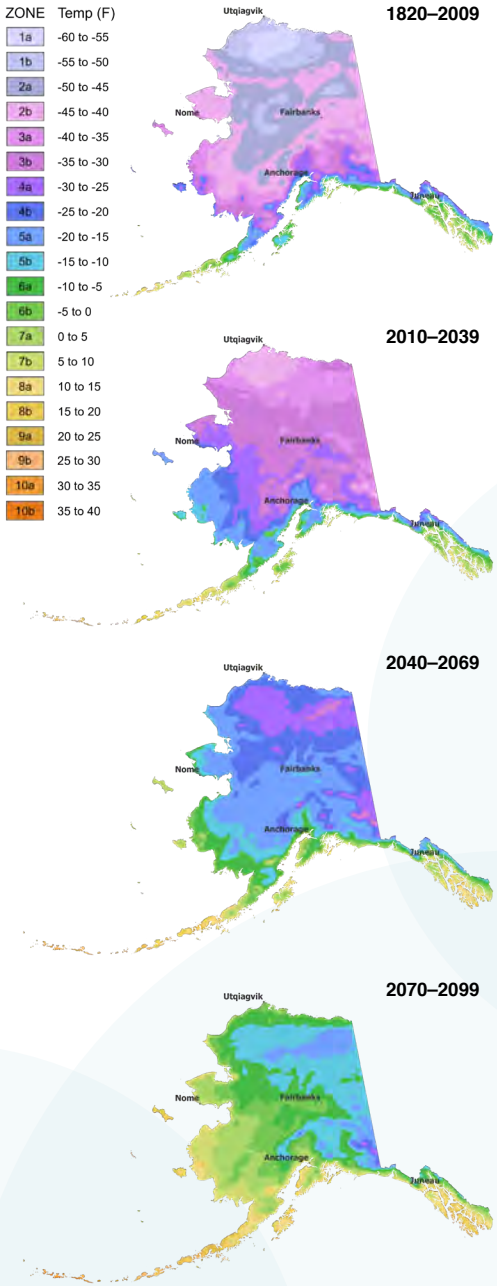
Data backbone

The tool's data comes from a coarse climate model updated with local topographic and climate information to make it usable at finer scales. This process, referred to as dynamical downscaling, is a focus of the Alaska Climate Adaptation Science Center. The technique was used by Rick Lader, John Walsh, Uma Bhatt and Peter Bieniek, as well as others, to develop the daily climate data, the tool's backbone. Computer programmer Alec Bennett and other team members then developed the web-accessible tool.

"Everything has been collaborative in this project," said Fresco.

Peonies bloom at Farthest North Flowers in Fairbanks Alaska. Photo by Krista Heeringa.





These maps show how plant hardiness zones may change in coming decades. Alaska could see a transition from primarily zone 1–4 crops, like kale, broccoli, potatoes and peas, to zone 5–7 crops, like tomatoes, corn and melons.

Looking forward

There is interest in expanding the tool to include native flora. While seasonally cultivated crops are usually not limited by winter cold temperatures, native plants may be affected by changing temperature minimums differently.

Warmer temperatures also may increase the likelihood of crop pests traditionally held at bay by Alaska's formidable winters. Shifts in growing season timing will affect other parts of the complex agricultural economy. One example is the burgeoning Alaska peony market, where the unique midsummer bloom drives sales. Alaska's peonies bloom in July, August, and September—later in the year than in other locations— when peonies are not available commercially anywhere else in the world.

While the tool highlights some negative impacts, it presents a largely positive look at the opportunities Alaskans can find in a changing climate. Fresco and the SNAP team hope the tool will help people not only grow food locally but also understand the changing climate's impact on agriculture and gardening in their communities.

"Not every community has a garden now," Fresco said, "but every community could consider one for their future food security."

BEYOND THE SCIENCE

COLLABORATION

Arctic Observing Summit

In spring 2020, IARC partnered with organizations and individuals from around the circumpolar north to co-host the Arctic Observing Summit. IARC director Hajo Eicken co-chaired the AOS Executive Organizing Committee.

Having been planned as an in-person event in Iceland, the organizing committee had only two weeks to transition the summit to 100% online in response to mounting coronavirus concerns. Following a monumental push by the organizing team and science communications experts, AOS successfully launched. Over 350 participants from 28 countries, including more than 40 Indigenous experts and representatives of Indigenous people and organizations attended.

AOS themes

The Arctic Observing Summit is a biennial event held in conjunction with Arctic Science Summit Week. AOS allows members of the Arctic observing community to exchange ideas and develop new ways to collaborate, share and improve international Arctic observing.

The 2020 AOS theme was "Observing for Action." The agenda was organized around five working groups:

1. Design, optimization and implementation of the observing system
2. Observing in support of adaptation and mitigation
3. Observing in support of Indigenous food security and related needs
4. Data interoperability and federated search (data integrity spanning collection and management over time to different data users)
5. Arctic observations in the context of global observing initiatives

These groups engaged attendees in discussion around the current state of Arctic observing, existing and future challenges and ways forward.

Outcomes

Four key recommendations emerged:

1. International observing activities should adopt an existing road map for identifying and prioritizing which Arctic variables to study and monitor.
2. Coordination of Arctic observations should be enhanced to better inform adaptation and policy responses.
3. International Arctic observing efforts should reflect holistic Indigenous worldviews with more engagement from Indigenous experts.
4. Observations should be stored in a broadly networked, collaborative, Arctic digital system based on a co-production model and ethical data principles.

Alaska's changing environment

Over the past 20 years, Alaska has experienced a clear shift toward more frequent large fire seasons with millions of acres burned. From 2001–2020, wildfire in Alaska burned 31.4 million acres. Over 2.5 times more acres burned than during the previous two decades.

In response to these changes, Alaska's fire management agencies are adapting quickly. New remote sensing tools, science-based decision making and strategic communication play critical roles.

IARC and the Alaska Fire Science Consortium partnered to produce a new publication that explores Alaska's Changing Wildfire Environment. The easy to understand and highly visual product highlights recent wildfire trends in Alaska, their impacts on humans and wildlife, and the strong relationship between wildfire managers and scientists to improve fire-related decision making. The report was extensively reviewed by state and federal wildfire managers across Alaska and is now a resource available to them when communicating with the public, stakeholders and policy makers.

In the 2.5 months since release, Alaska's Changing Wildfire Environment has been read over 2,500 times.

Part of a broader series

The publication is part of the Alaska's Changing Environment series. That inaugural report, released in 2019, compiled observations of physical and biological change in and around Alaska. It covered oceans, land, temperature, precipitation plants, animals and more. The publication has been read over 17,000 times. Regional companion pieces are being developed about changes in the Bering Sea, Yukon Flats and Southeast Alaska.

Example spread from Alaska's Changing Wildfire Environment demonstrating how wildfire has changed over the past decades.

NEW IN 2020

119

PEOPLE

IARC is home to 119 science faculty, staff, students and affiliates.

1:7

FUNDING

For every dollar invested in IARC from the state of Alaska we earned seven dollars through competitive research grants, partnerships and other contracts.

112

PROJECTS

People at IARC are working on 112 research projects that investigate many elements of the Arctic system, including ocean, ice atmosphere, land and society.

95

PUBLICATIONS

IARC was named as affiliated institutions on 95 peer reviewed publications and technical reports.

IARC welcomed new faculty & staff

Bob Torgerson, software programmer & systems administrator

Greta Goto, workforce development

Thomas Ballinger, climate modeling Research Assistant Professor

Mike DeLue, science communicator

Tobias (Toby) Schwoerer, natural resource economics Research Assistant Professor

New graduate students & post-docs

Abigail Hicks, Alaska LCC evaluation

Amy Hendricks, Arctic observing

Eva Burk, food security

Kimberly Kivvaq Pikok, Indigenous observations

Michael Lundberg, Arctic Ocean dynamics

Mik' (Elizabeth) Lindley, salmon and communities

Nicholas Parlato, Arctic policy

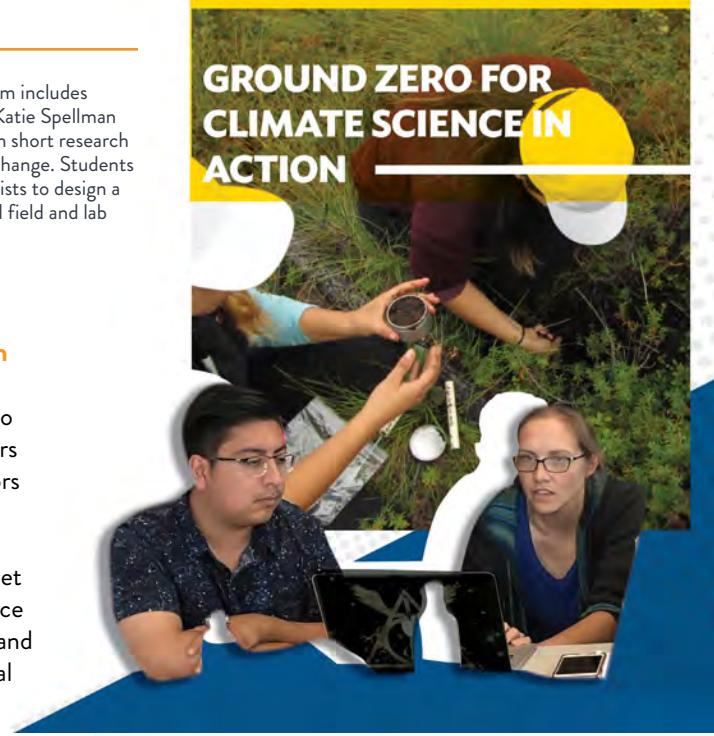
Rémi Pagès, oceanography

New & continuing agreements

IARC collaborates with organizations in the US, Canada, Europe, Russia and Asia to make international research more relevant in an Arctic context. Our formalized collaborations include:

- Aleutian Pribilof Islands Association
- Alfred Wegener Institute, Germany
- Arctic Research Center, Hokkaido University
- Chinese Academy of Sciences
- Japan Agency for Marine-Earth Science & Technology
- Korea Polar Research Institute
- National Institute of Polar Research, Japan
- NOAA Fisheries Alaska
- Russian Academy of Sciences, Far Eastern Branch
- Shanghai Jiao Tong University, China
- Swiss Federal Institute for Forest, Landscape and Snow
- University of Toyama, Japan
- University of Tsukuba, Japan

Right: The Climate Scholars Program includes summer climate intensives lead by Katie Spellman and designed to immerse students in short research projects on the impacts of climate change. Students work alongside IARC climate scientists to design a research project, conduct ecological field and lab work, and analyze data.



IARC scientists lead new Climate Scholars Program

IARC's Katie Spellman and Kristin Timm were selected to lead the new Climate Scholars Program within UAF's Honors College alongside director Alex Hirsch. The program launched spring 2020 to meet student interest and workforce demands for the knowledge and skills needed to address global climate change.

The Climate Scholars Program provides a unique interdisciplinary, experiential and action-oriented opportunity for UAF undergraduates. It attracts high-achieving students interested in pursuing a rigorous academic experience while making an impact locally and globally.

Building the climate workforce

Participants pursue traditional academic work alongside internships, summer intensive courses and research experiences, student exchanges and a capstone project. Learning takes place as much outside the classroom as in, and students have the opportunity to work closely with leading researchers in climate science at IARC and other research units across UAF. This structure better prepares students to tackle the world's biggest climate challenges and meet the climate science needs in government, non-profit and the private sector. IARC scientists and other UAF alumni now mentor students, and efforts are underway to connect students to the industries and organizations that have the greatest need for their skills.

"Climate Scholars is like an experiential layer on top of the student's undergraduate program," said Timm who brings expertise in climate change communication to her leadership role in the program. "Students from any discipline are welcome, and we aim to prepare students to lead and collaborate on climate change-related work after they graduate."

The interdisciplinary structure of the Climate Scholars Program challenges students to think more holistically about climate change as a cross-cutting issue. This approach prepares students to address real-world problems and become leaders in clean energy, environmental engineering, education, public policy and more.

The first full cohort of climate scholars began in fall 2020. During which Timm and Spellman taught a 100-level kick-off course called "Our Changing Climate: Past, Present, Future."

CONSORTIUM

Our scientists work on independent research as well as through larger initiatives. The following are groups and collaborations at IARC that build connections between research and stakeholders within and outside the United States.

Alaska Arctic Observatory and Knowledge Hub
Provides northern Alaska coastal communities with the tools, resources, and scientific and administrative support to share their expertise. arctic-aok.org

Alaska Center for Climate Assessment and Policy
Partners with stakeholders to inform realistic community plans and climate adaptation strategies. accap.uaf.edu

Alaska Climate Adaptation Science Center
Provides scientific information, tools and techniques that managers can use to anticipate, monitor and adapt to climate change. casc.alaska.edu

Alaska Fire Science Consortium
Promotes communication and collaboration between fire science research and managers. frames.gov/partner-sites/afsc

Alaska Global Learning and Observations to Benefit the Environment
Provides students the opportunity to participate in science. globe.gov

Arctic & Earth SIGNS
Connects youth and adults to climate change learning. sites.google.com/alaska.edu/arcticandearthsigns

Center for Arctic Policy Studies
Brings together knowledge and expertise of University of Alaska scholars to more readily serve policy makers in the Arctic. caps.uaf.edu

Cooperative Institute for Climate, Ocean, and Ecosystem Studies
Taps into the brainpower at universities to help meet NOAA's research, education, and public engagement goals. cicoes.alaska.edu

Experimental Arctic Prediction Initiative
Develops innovative seasonal and subseasonal weather prediction specifically for the North. sites.google.com/alaska.edu/eapi

Inspiring Girls Expeditions
Leads free wilderness science expeditions for high school girls. inspiringgirls.org

Nansen and Amundsen Basins Observational System
Studies climatic changes in the eastern Arctic Ocean. uaf-iarc.org/nabos

Next Generation Ecosystem Experiments
Quantifies the physical, chemical and biological behavior of terrestrial ecosystems in Alaska. ngee-arctic.ornl.gov

Scenarios Network for Alaska + Arctic Planning
Helps people plan in a changing climate by exploring possible futures based on the best science and data available. snap.uaf.edu

Talk about Arctic science

IARC PhD student Marc Oggier drills through the sea ice while conducting research for the MOSAiC expedition in the central Arctic Ocean. Photo by Marcel Nicolaus.

CONTRIBUTE

Support Arctic research by learning about our work and engaging in Arctic science conversations with your friends, family, colleagues and decision makers.

Donations also play an important role in securing the future of the International Arctic Research Center's work. Your support can help safeguard Arctic research, making a difference in the lives of people living in the Arctic, as well as those around the globe being impacted by dramatic change in polar regions.

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UNDERSTANDING THE ARCTIC TO MAKE A DIFFERENCE

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