SIPN² Sea Ice Prediction Network

Welcome

Sea Ice Prediction Network – Phase 2 (SIPN2) Webinar Series

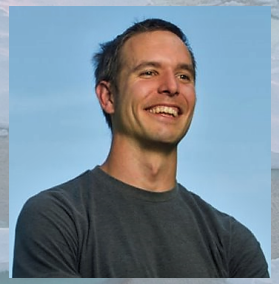
"Understanding Stakeholder Information Needs for Sea-Ice Forecasting"

28 April 2020

Presenters:

Hajo Eicken
International Arctic Research Center Director

Joseph Little
Economics Program Director, Univ. of Alaska Fairbanks School of Management



Zeke Baker
Postdoctoral Research Associate, University of Oklahoma and National Weather Service-Alaska

Marta Terrado
Science Communication Specialist, Barcelona Supercomputing Center

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SIPN² Sea Ice Prediction Network

Webinar Guidelines

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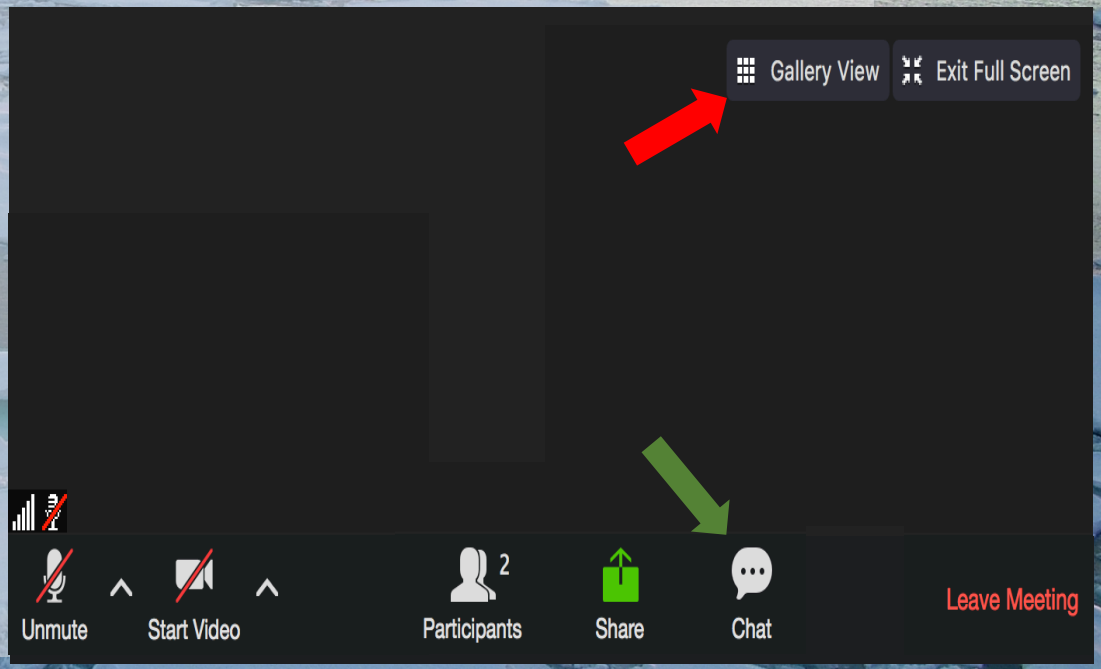

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Guidelines for Asking Questions

Questions will be addressed during the question and answer session following the presentations.

Joining by Zoom: type your questions into the chat window at any time. I will read them aloud during the Q & A.

Joining by YouTube Livestream: type your questions in the “live chat" window. A facilitator will share your questions with me to read aloud.

Joining by Phone: you will need to raise your hand by pressing *9 — and unmute yourself by pressing *6 to ask your question aloud.

For technical support, contact Kuba Grzeda via Chat or email, kuba@arcus.org.

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Speaker Introductions

"Understanding Stakeholder Information Needs for Sea-Ice Forecasting"

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Regional ice information product user needs

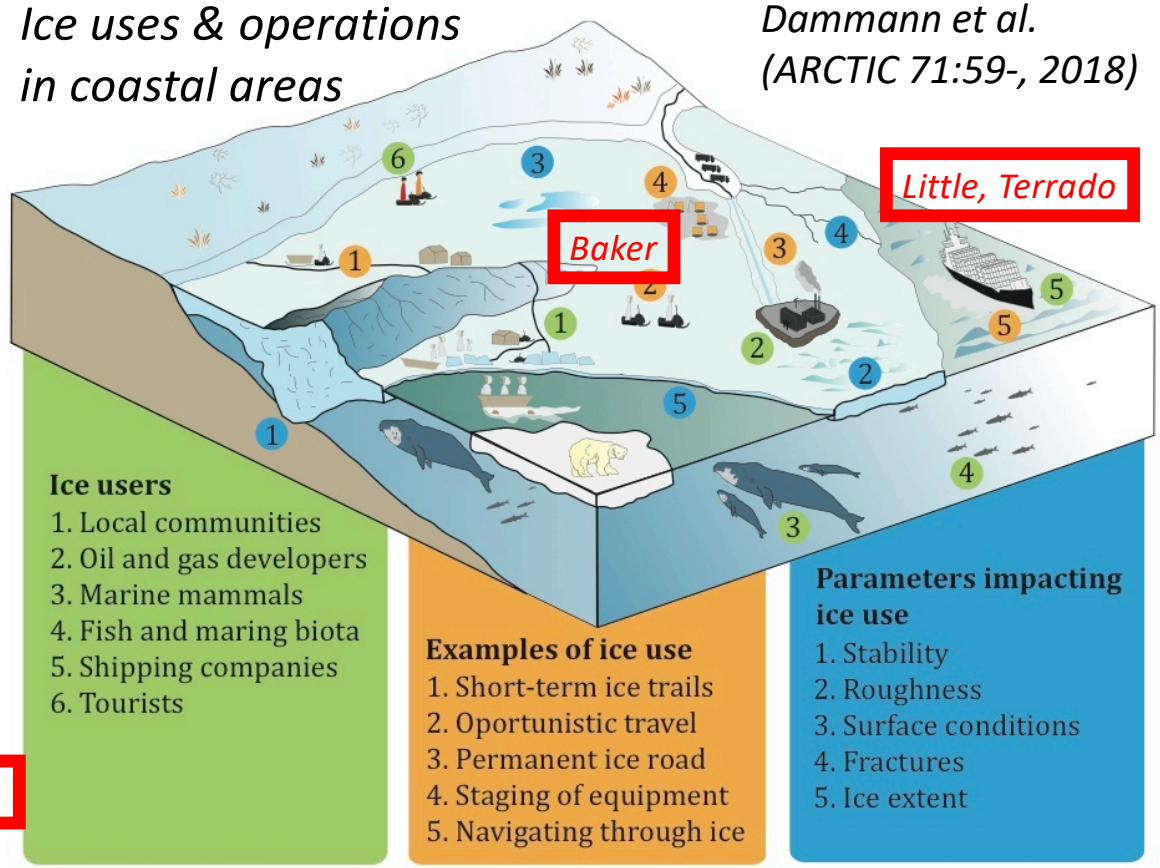
- ***Input and engagement includes:***
  - National Weather Service AK Region, Don Moore, Decision Support Lead
  - Alaska Arctic Observatory & Knowledge Hub (arctic-aok.org) – Bering Strait to Barter Island
  - Sea Ice for Walrus Outlook (SIWO) – Bering Straits (www.arcus.org/siwo)
  - Ikaaġvik Sikukun – Kotzebue Sound (www.ikaagviksikukun.org)

→ Co-production approaches

Baker, Terrado

Ice uses & operations in coastal areas

Dammann et al. (ARCTIC 71:59-, 2018)



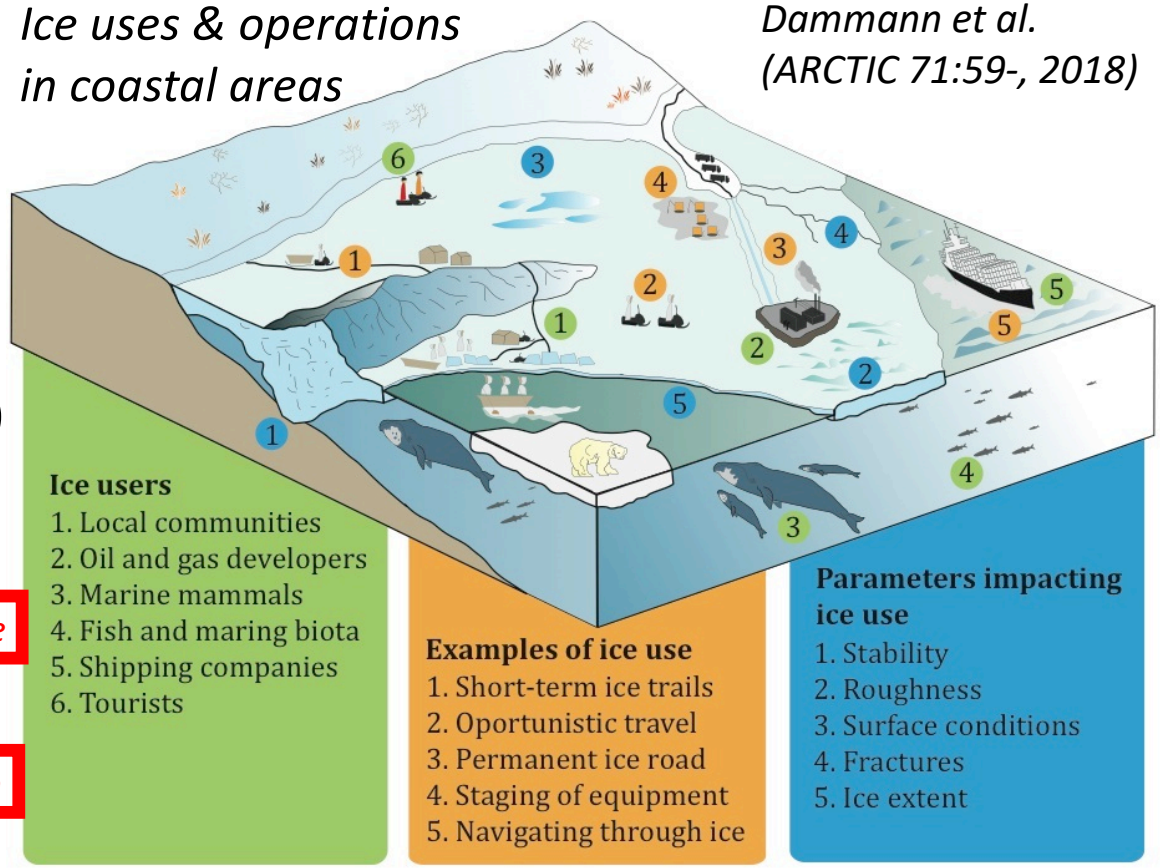
Regional ice information product user needs

- ***Ice uses & ice hazards***
  - Presence of ice restricts maritime access & represents operational hazard → Ice concentration & quality
  - Use of (landfast) ice as a platform → Seasonal cycle, ice quality

- ***Key ice information user groups (e.g.)***
  - Coastal communities: Indigenous ice uses; access & transport pathways
  - Fishing/crabbing industry: Ice hazards
  - Resource extraction industry: Access & use of ice as platform

Ice uses & operations in coastal areas

Dammann et al. (ARCTIC 71:59-, 2018)



Baker

Little

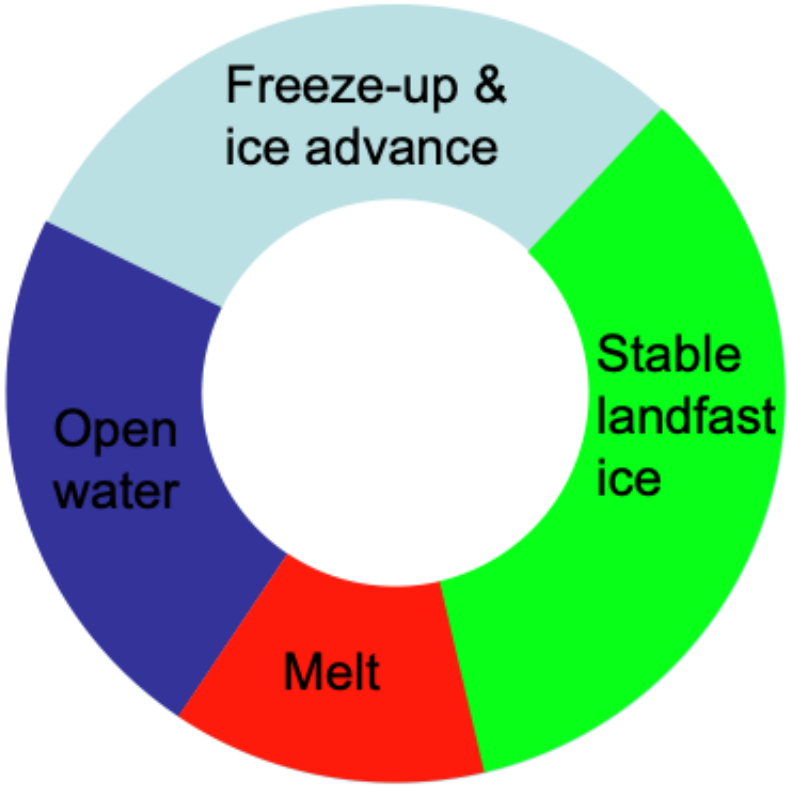
Terrado

Regional ice information product user needs

- ***Prediction needs***

Prediction needs are driven by planning & decision-making context – use of information needs to be clearly understood

- Predictand variables: Ice extent & quality, seasonal cycle & key events
- Spatial scale: community-scale (Baker m), regional (Little km), pan-Arctic (Terrado)
- Timescale: hours-days → hazards, weeks-months → access & ice use
- Predictive skill & uncertainty: Determined by tolerable economic/risk factors

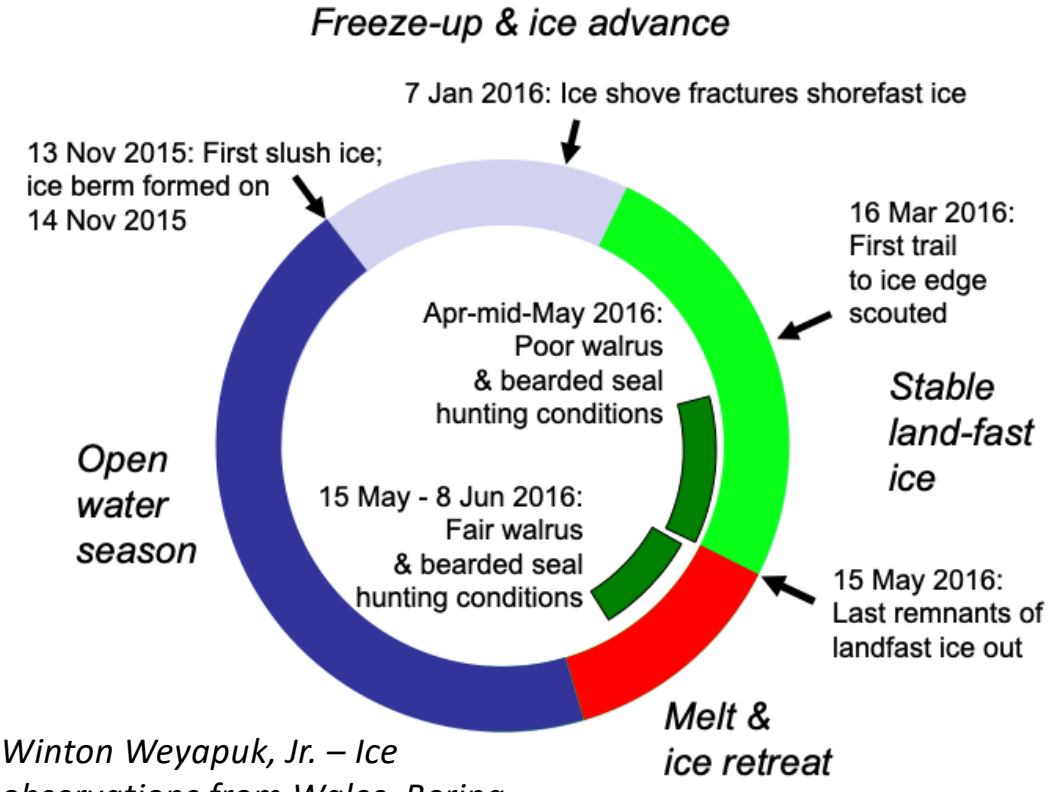


Regional ice information product user needs

- ***Prediction needs***

Prediction needs are driven by planning & decision-making context – use of information needs to be clearly understood

- Predictand variables: Ice extent & quality, seasonal cycle & key events
- Spatial scale: community-scale (<50 km), regional (100s km), pan-Arctic
- Timescale: hours-days → hazards, weeks-months → access & ice use
- Predictive skill & uncertainty: Determined by tolerable economic/risk factors



Winton Weyapuk, Jr. – Ice observations from Wales, Bering Strait, Alaska (arctic-aok.org)

Evaluating Stakeholder Preferences for Seasonal Scale Sea Ice Prediction: Early Insights from a Field Survey

April 28, 2020

Acknowledgements

- Thank You
  - Alaska Bering Sea Crabbers
  - Jamie Goen
  - Jake Jacobsen
  - SIPN2
  - ARCUS
  - National Science Foundation

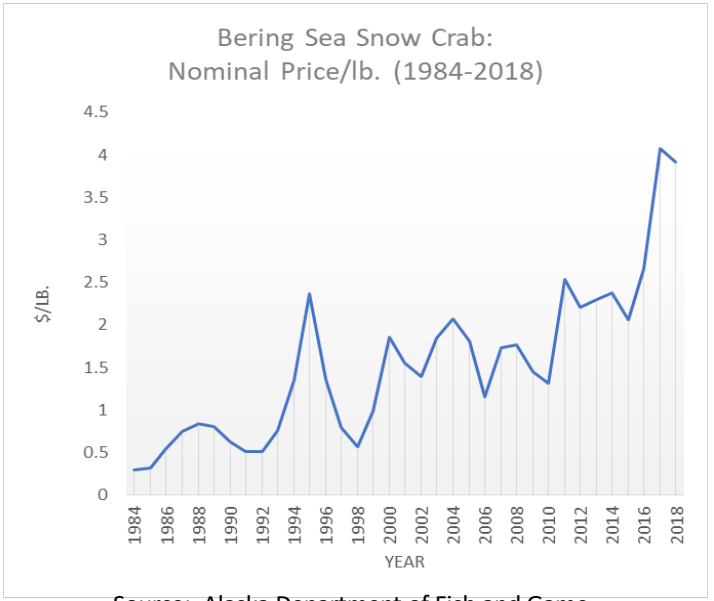
And others!

Introduction: Bering Sea Crabbers and Sub-Seasonal Sea Ice Forecasts

- Overview
  - Stakeholder Engagement with Bering Sea Crabbers
- Survey Content
  - Experience with Sea Ice
  - Early Views on 1-Month Forecast
- Early Insights
  - Utility in Operations
  - Attributes: Where, When
- Challenges
  - Pandemic
  - Small Sample

Supporting Bering Sea Crabbers with Seasonal Sea Ice Forecasts

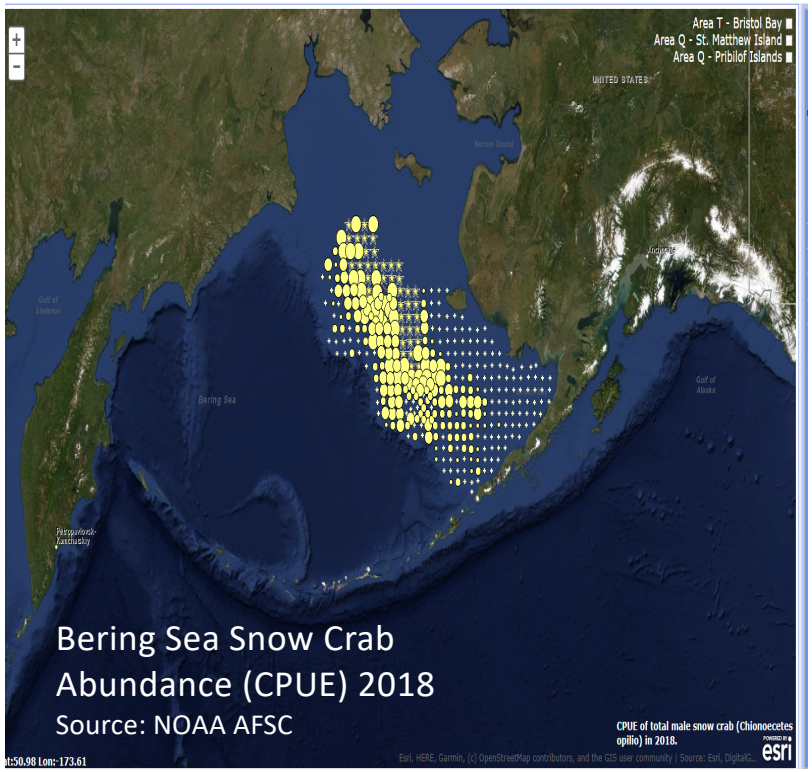
- Bering Sea crab fishery commercially important
  - Bering Sea crab harvests comprise 23% of ex vessel value of all commercially harvested fish in the Bering Sea Aleutian Island Region (approx. $220 million 2015/2016 season, McDowell 2017)
  - Between 75-100 Crab Boats in Bering
- Timing of crab season (Oct. 15-May 15)
  - Currently use short term sea ice forecasts from NWS
  - Need for seasonal scale forecast undefined
- Engage crab fishery stakeholders using online survey



Source: Alaska Department of Fish and Game

Supporting Bering Sea Crabbers with Seasonal Sea Ice Forecasts

- Areas of Survey Focus
  - Background
  - Experience and Operations Near Sea Ice
    - Proximity
    - Past Negative Events
  - Timing of forecasts
    - Priority months for seasonal forecast (Jan.-May)
  - Use in Operations
    - Safety
  - Location
    - Forecast information for preferred fishing locations



Challenges and Limitations

- Surveying during this time has been challenging
- Treat as a focus group being used to inform further research
  - 13 total respondents with mixed item non-response
  - 10 respondents answered 80% or more of the questions
- Opportunity for future engagement when things settle down

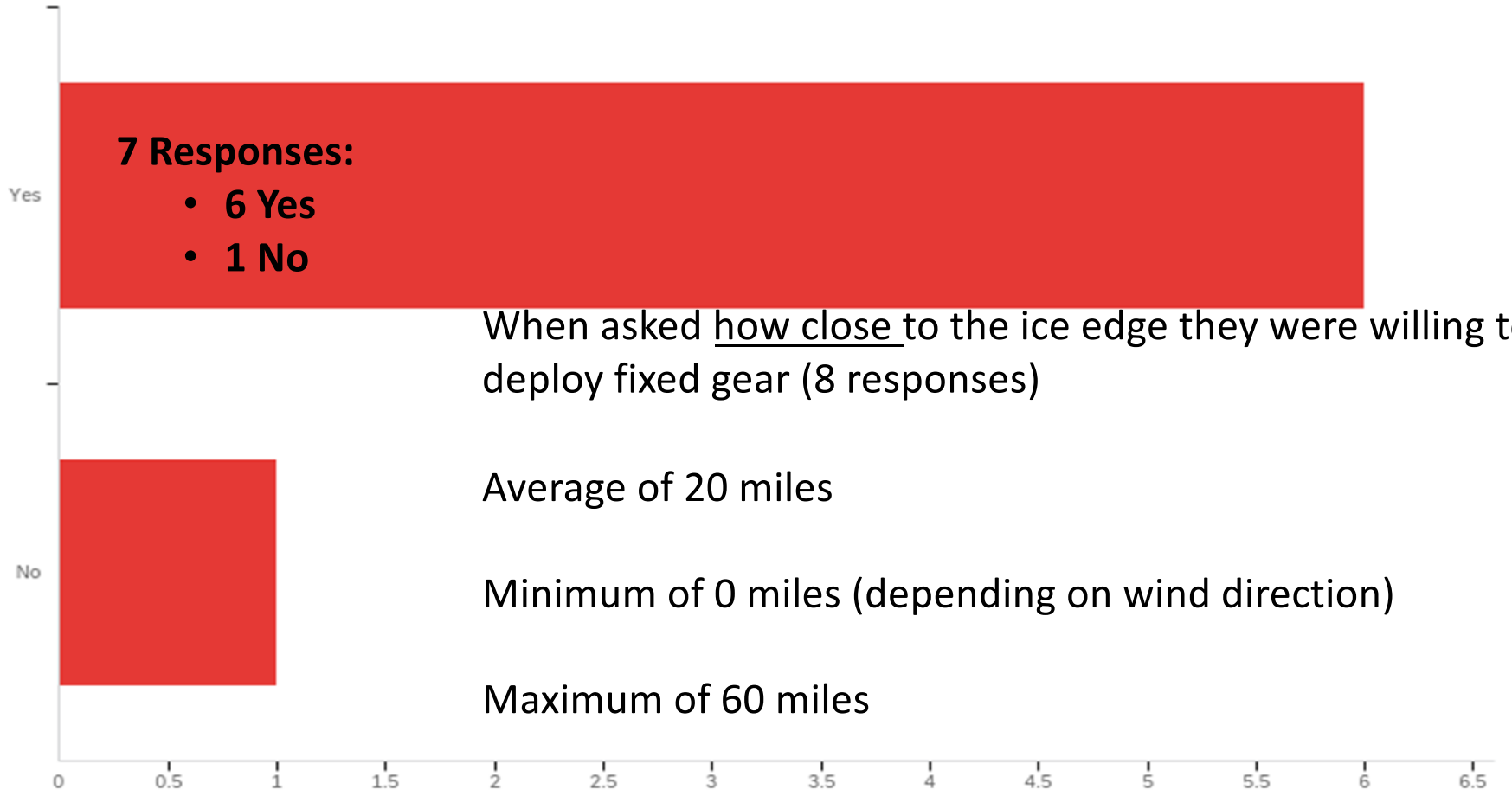
Respondent Background

- 13 Respondents
  - 12 crab boats
  - 1 cod boat
- Experience
  - 30 Years on average (16 years to 40+ years) operating in Bering Sea
- Primary Crab Species Fished
  - Snow Crab
  - Red King Crab
- All Respondents Report Checking NWS Sea Ice Forecast at Least Every Other Day.
  - Six individuals reported checking more than once per day

Past (Negative) Experience with Sea Ice

- Top three reported negative experiences resulting from sea ice (Since 2005)
  - Lost Gear
    - Lost crab pots are expensive ($1,000 empty)
  - Days Lost Fishing
    - Can't access preferred locations
  - Vessel Damage
- 4 Respondents willing to operate in open drift with small floe, 3 respondents operate in open drift with large floe
- No respondent indicated working in pack ice.

Is Fishing Better Near the Ice Edge?



7 Responses:

- **6 Yes**
- **1 No**

When asked how close to the ice edge they were willing to deploy fixed gear (8 responses)

Average of 20 miles

Minimum of 0 miles (depending on wind direction)

Maximum of 60 miles

Respondent Insights: Current Impact of Sea Ice on Overall Operations

"It is nice to know where the ice pack is, what direction it is moving and how fast. If we know what the ice is doing we can make educated planning for deliveries, if we can leave our pots near the ice or move them farther away from the ice pack"

"Last few years ice was not an issue but this year it moved us off good fishing grounds"

"Having to relocate gear before delivering"

"We have stayed away from ice edge fish for several years. Ice has not been present in our traditional fishing grounds"

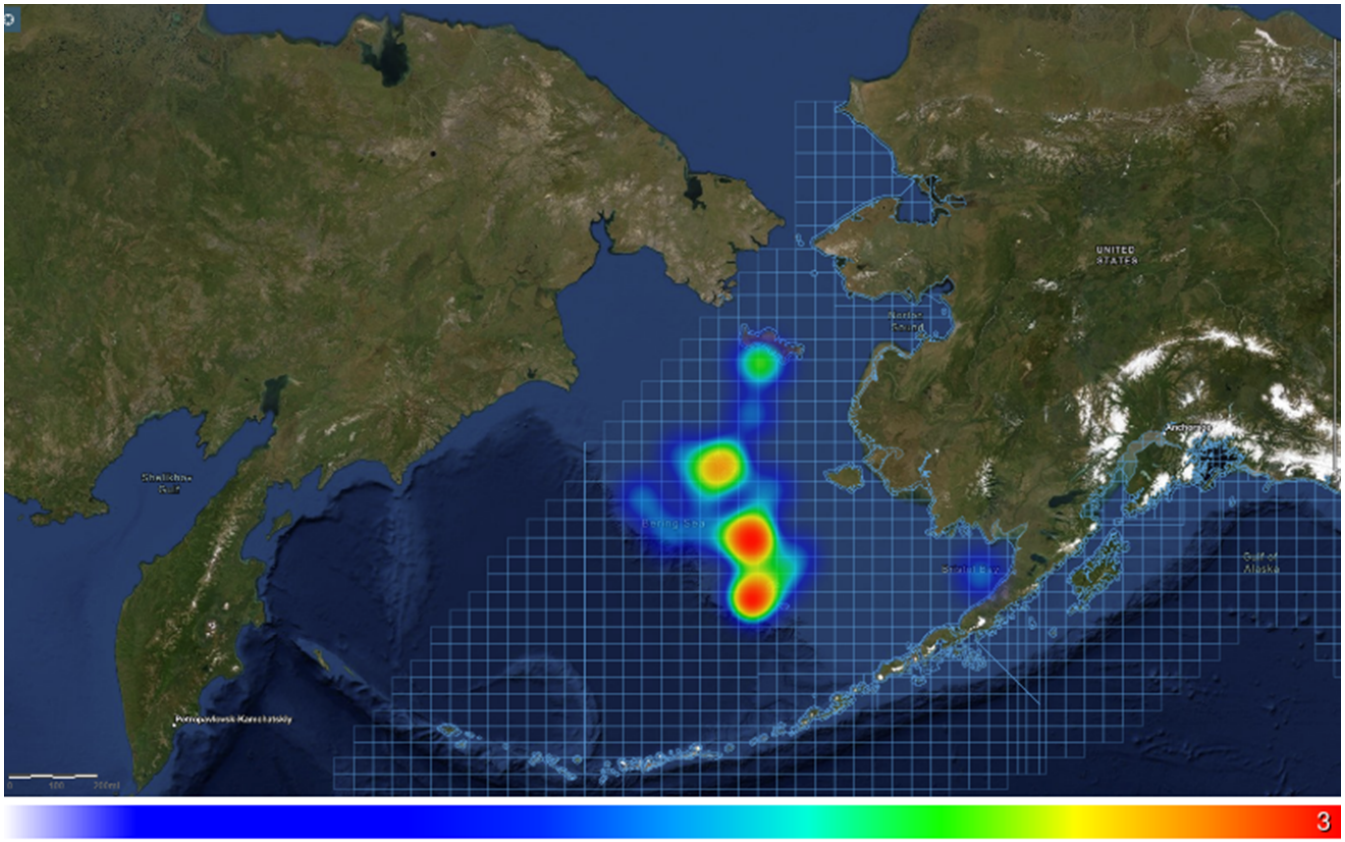
Respondent Insight: What Operations Aspects Affected by Longer Run Forecast

- Respondents were asked with operations would most benefit from availability of 1-month forecast
- Options included
  - Safety
  - Route Planning Navigation
  - Resupply
  - Fuel Purchases
  - others
- 6 respondents indicated that a 1-month forecast would enhance **safety**

Also…..

- Choice of Fishing Location
  - Productive fishing and presence of ice
  - Definition: CPUE-Catch Per Unit of Effort
- Timing of Delivery
  - Access to St. Paul

Location Preference for 1 Month Forecast



Heat Map Exercise:

Respondents could indicate three locations where they would like to have a sea ice forecast 1-Month in Advance

Respondent Insight: 1-Month Forecast Affect on Fishing Location Choice

"It could give a very rough idea of where we might be able to fish in the future, but I assume would not be very accurate."

"Would help in deciding how much gear to put out on the fishing grounds during a season"

"It would make a big difference"

Respondent Rankings for Ice Attribute Information and Month for Forecast

Ice Attribute Information

- Based on average rank
  1. Location
  2. Extent
  3. Direction
  4. Concentration
  5. Stage

Forecast Month Preference

- Based on Average Rank
  1. January
  2. February
  3. April
  4. March
  5. May

Closing Comments

- Survey is a work in progress
  - Will continue through May
- Respondents expressed interest in longer run sea ice forecasts
  - Location, Extent, Direction
- Useful
  - Safety
  - Fishing location
- Future steps
  - How to convey forecast info to stakeholder
  - Evaluate use of forecast by sub-set of ships

Thank You

- Please contact me if you have questions/comments
- Joe Little: jmlittle2@alaska.edu

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Anticipatory Culture in the Bering Sea

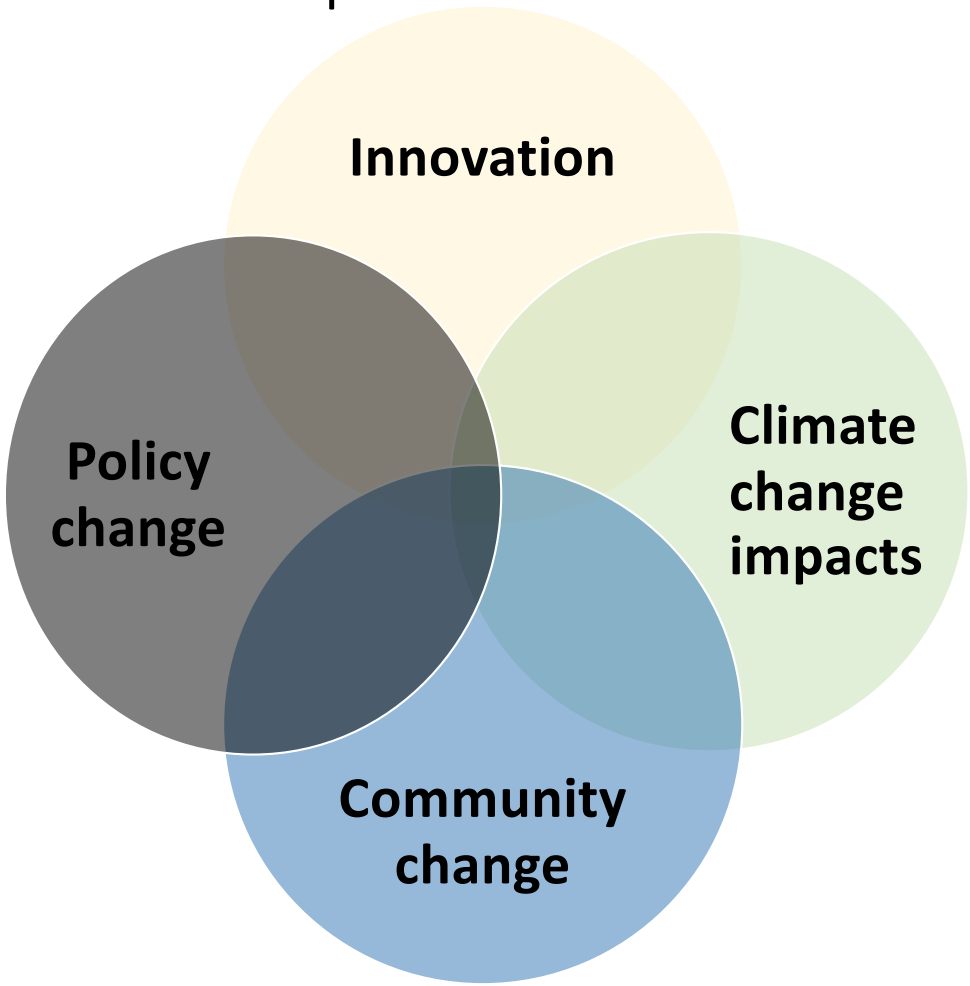
Marine and Sea Ice Information in Sociological Perspective

Research question

What is the value of marine weather information to decisions and livelihood made in the Bering Sea in the face of social and environmental change?

Social context of weather information production and use in Alaska

- Scientific innovation
- Increase in use of private weather services
- Rise in internet access and digital technology use
- Changing experiences and expectations of weather, given climate change
- A shift in the National Weather Service towards ‘impact-based decision support services’ (IDSS).



Anticipatory Culture

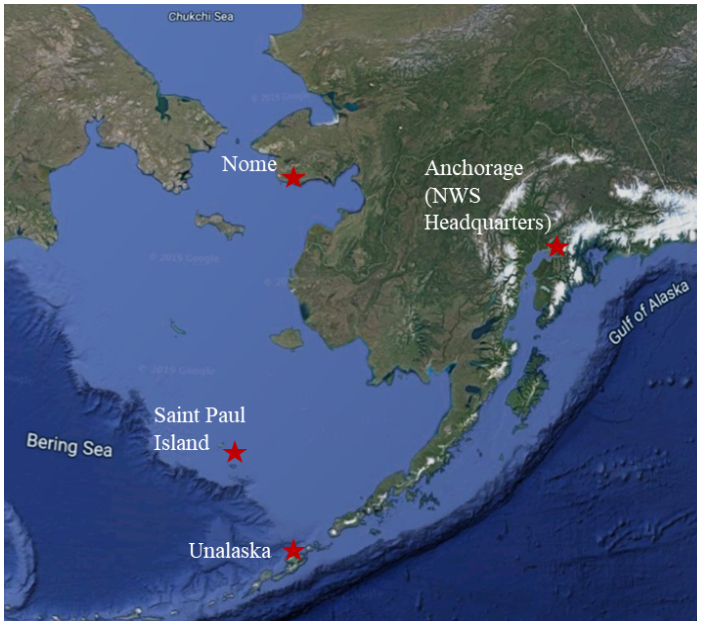
Anticipatory culture comprises the practical and symbolic ways through which actors answers the questions, “what’s next?” and “now what?”

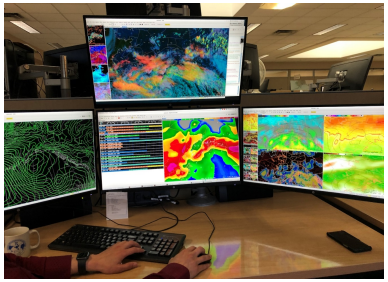
Temporal dissonance: the challenges and negotiations that derive from new or uncertain answers to these two basic questions.

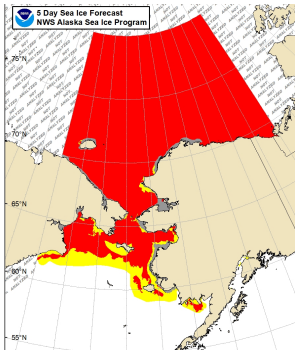
Tavory and Eliasoph 2013; Jasanoff and Kim 2015; Hulme 2017; Mische 2014; Anderssen 2018; Daipha 2015; Fine 2007; Pietruska 2016; Hall 2016; Beckert 2016; Coleman and Tutton 2017; Livingstone 2015; Anderson 2010; Adam 1998; Hall 2016; Baker et al. 2018; Elliot 2018

Methods and Data

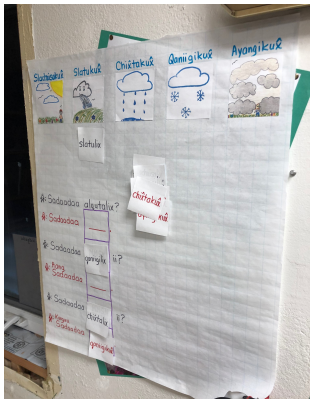
- Research Sites:
  - Unalaska (Aleutian Islands)
  - Saint Paul (Pribilof Islands)
  - Nome (*On Hold)
  - NWS Alaska
- 36 semi-structured interviews
- Observation, outreach, and shadowing
- Materials transcribed, coded, and analysis (in progress) using qualitative data analysis







1. Climate and livelihood: Temporal dissonance on a generational timescale

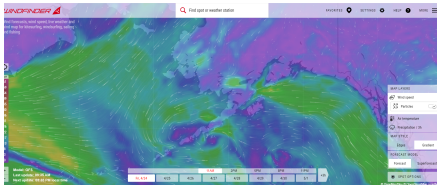


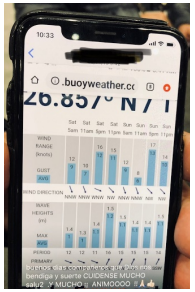
- Historical context matter for how people consider environmental change
- Sea ice as a metric of Bering Sea health and environmental insecurity

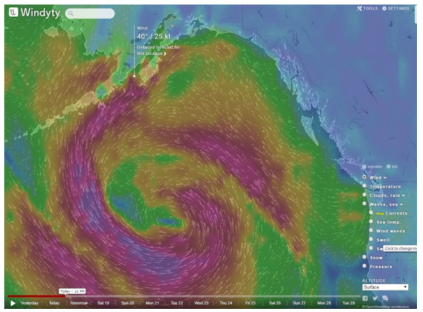
2. “Everything seems unpredictable”: Unanticipated seasonality

- A declining sense of seasonal patterns
- Economic uncertainty because of overlapping seasonal-scale changes
- Dissonance opens the door to exposure to weather risk
- Divergent responses to changing ice conditions among mariners

3. Weather, Risky Decisions, and the Information Environment







Shaping Anticipatory Culture?

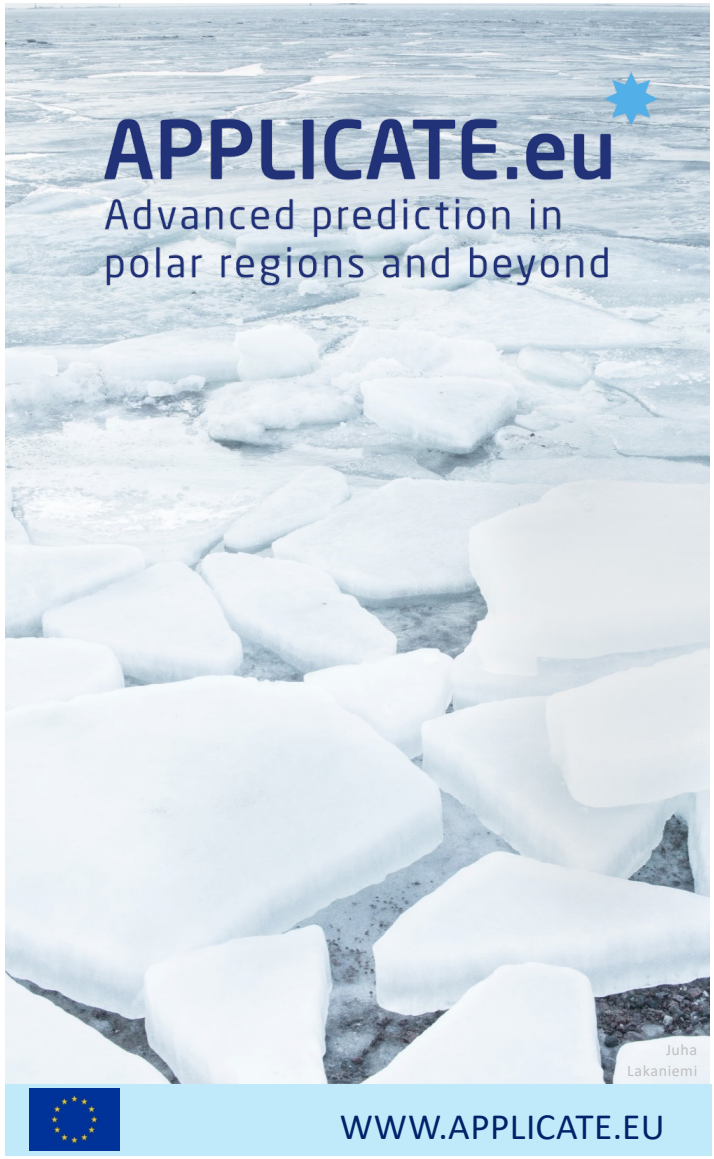
- Prediction of a geophysical state is different than a shared anticipation of the future.
- Gaining practical cognition of users' situation
  - The capacity to "think like a user" orients weather forecast practices to perceived event impacts
- Knowledge of user situations allows meteorologists to tailor Warnings and Advisories based on *meteorological* thresholds but also decision-relevant *impact* thresholds
  - "Ground truth" may be geographically and culturally unequal
- Human interaction matters
  - Faces, names, and relationships embody credibility, trust, and expertise that predictive information cannot provide.
- New products must be mindful of the complex informational environment, which can both enhance and complicate shared anticipations of the future.


Thank you!
Zeke Baker, zbaker@ou.edu

Inspiring the sea ice forecasting community to co-produce knowledge

Marta Terrado and Dragana Bojović

Barcelona Supercomputing Center
Centro Nacional de Supercomputación

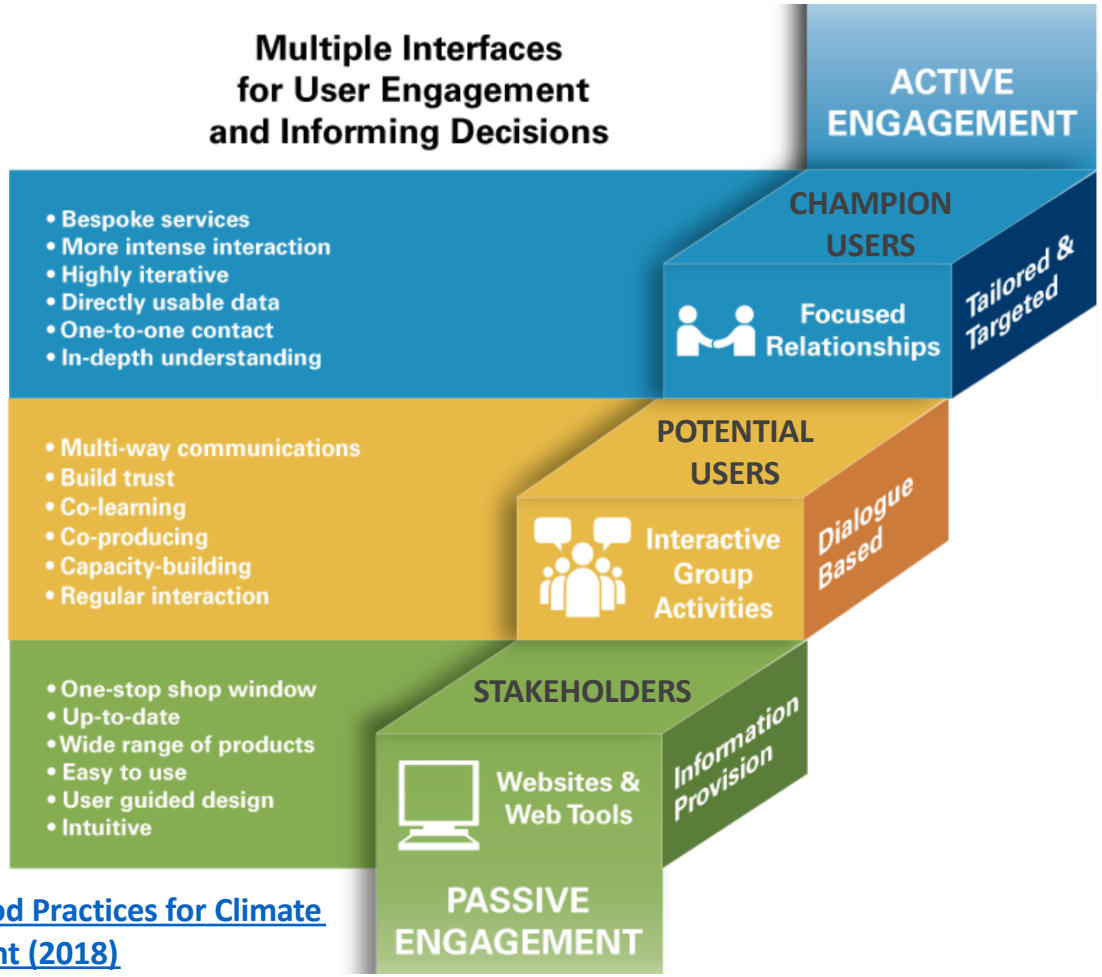


IN A NUTSHELL

Develop enhanced predictive capacity for weather and climate in the Arctic and beyond and determine the influence of Arctic climate change on Northern Hemisphere mid-latitudes, **for the benefit of policy makers, businesses and society**.

KNOWLEDGE CO-PRODUCTION

APPLICATE.eu
Advanced prediction in polar regions and beyond



EMPOWERMENT
CO-DEVELOPMENT

INVOLVEMENT
KNOWLEDGE EXCHANGE

ENGAGEMENT
AWARENESS RAISING

Adapted from

[WMO's Guidance on Good Practices for Climate Services User Engagement (2018)]

KNOWLEDGE CO-PRODUCTION

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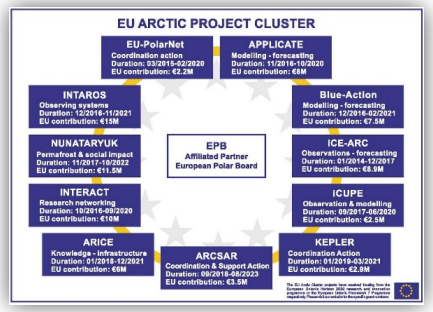
USER GROUP

BLOG Polar Prediction Matters

CASE STUDIES

WORKSHOPS

EU-POLAR CLUSTER/ OTHER PROJECTS



ECS

USER GROUP

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10 qualified representatives from:

- Scientific community and international organisations
- Public and private sector
- Society, including local and indigenous communities

Aim

- Comprehensive overview
- Advice and feedback to the project
- Help shaping data into relevant information and services

Challenges

- Find stakeholders/ Gender balance
- Equal contribution
- Sectoral & geographical coverage (bias)
- Over-generalisation
- Meetings: online vs face-to-face (relevant conferences, project GA…)
- User participation in kind vs project partners
- Need to report results back

EACH STAKEHOLDER IS UNIQUE

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Search and rescue

Inuit local hunters

Sea transportation and icebreaking

- Different backgrounds
- Different types of decisions
- Different information needs

There is no
'one solution that fits all'
(even within the same sector)

STAKEHOLDERS MAKE DECISIONS UNDER DIFFERENT CONTEXTS

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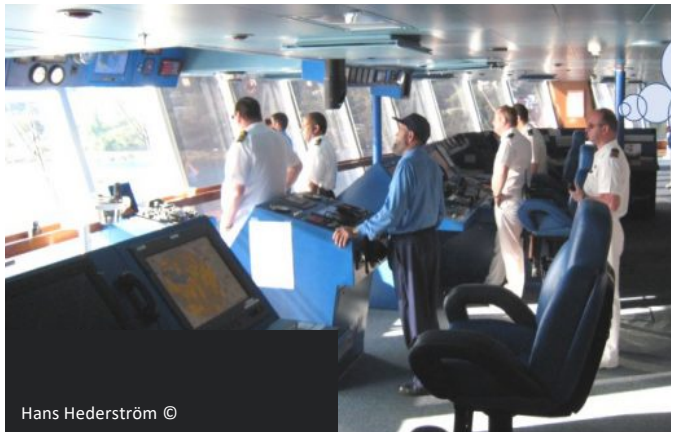
Immediate/ day-to-day decisions

'Survival'

Almost real-time tools documenting ice conditions



Short- and mid-term operational/management decisions

Optimization of navigation costs

Sea ice predictions for next weeks and months

Long-term regulatory and planning decisions

Climate change adaptation policies

Projections for the end of the century

CASE STUDIES

APPLICATE.eu
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Particular **EXTREME** events of the past Arctic weather and climate with an **IMPACT** on specific aspects of the society or the economy of Arctic regions and beyond (identified by stakeholders)

- **Communicate** how project outputs are useful for different stakeholders (moving from models or data to decision-making)
- **Collaborate with stakeholders** by integrating their knowledge and experience (co-production)
- **Showcase the utility of weather, climate and sea ice predictions** (i.e., how this information would have been useful if available in the moment of the event)
- Compare the impact of the decisions taken **with and without the use of predictions**
- Identify **research gaps**

CASE STUDY: Winter cold spell impact on the energy market

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ENERGY CASE STUDY

HOW DOES ARCTIC SEA ICE AFFECT ENERGY PRODUCTION IN MID-LATITUDES?

1 Winter sea ice concentration — Historical low winter sea ice in the Barents and Kara seas

2 Cold spell — Atmospheric blocking over Europe responsible for:
- Cold spell
- Lower precipitation
- Lower wind speed

3 Energy demand — Increase in energy demand and lower than usual hydro and wind power generation

CHAIN OF EVENTS

1. Historical low sea ice concentration in the Barents and Kara (BK) seas.

During November and December 2016, extreme warm temperatures were observed in the Arctic. As a result, the total Arctic sea ice extent experienced a historical low value, with negative anomalies[A] in most of the Arctic, but especially strong in the BK seas (Acosta Navarro et al. 2018). According to existing records, a breakpoint in sea ice loss (i.e., an accelerated decline) over the BK seas took place in the early 2000 (Close et al. 2015). In the last decade several studies have found causal links between low Arctic sea ice cover in the late autumn and extreme climate anomalies in the following winter in mid-latitudes (Cohen et al. 2014, Screen et al. 2018). In the framework of the APPLICATE project, retrospective forecasts[B] with the EC-Earth3 climate model (Doblas-Reyes et al. 2013) were performed to attribute the role of extremely reduced Arctic sea ice conditions (mostly over BK) with regard to the extremely low precipitation event in Europe in winter 2016-2017 (Acosta Navarro et al. 2018; see Fig.1).

GLOSSARY

A

Anomaly: difference between the sea ice extent, area or concentration at a given time and the long-term average. When it is negative, an anomaly indicates there is less ice than average for a given month.

B

Retrospective forecast: refers to a forecast made for a period of the past using only information available before the beginning of the forecast.

Contributors:

Marta Terrado, Dragana Bojovic, Isadora Christel, Juan Acosta, Pablo Ortega, Markus Donat, Llorenç Lledo (BSC-CNS, Spain), Halldór Johannsson (AP, Iceland), Thomas Jung (AWI, Germany); 2019.

1

Find other case studies at:
https://applicate.eu/outreach/case-studies

Energy Transition
The Global Energiewende

France can't meet its own power demand

by Craig Morris
20 Jan 2017

As expected, France was heavily dependent on power imports during the first cold spell of this winter. Yet, most of the country's reactors are back online. The US is now also investigating 17 reactors with parts from France that could also be defective. Craig Morris has the details.

A cold snap in France and nuclear shutdowns *(Photo by Flavio Ensiki, edited, CC BY 2.0)*

S2S4E
Climate Services for Clean Energy

CASE STUDY: Winter cold spell impact on the energy market

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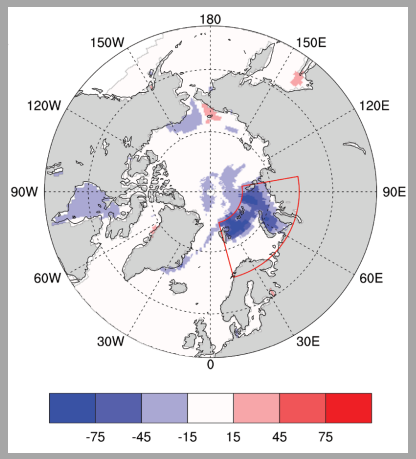
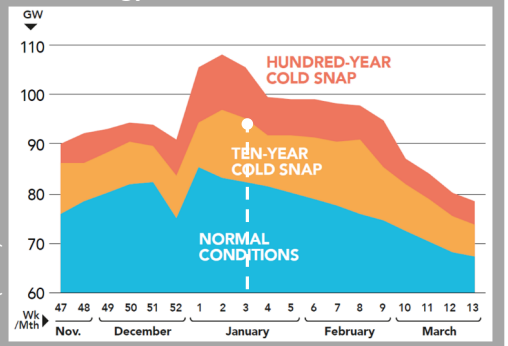
Sea ice concentration anomaly
Barents and Kara Seas Nov-Dec 2016



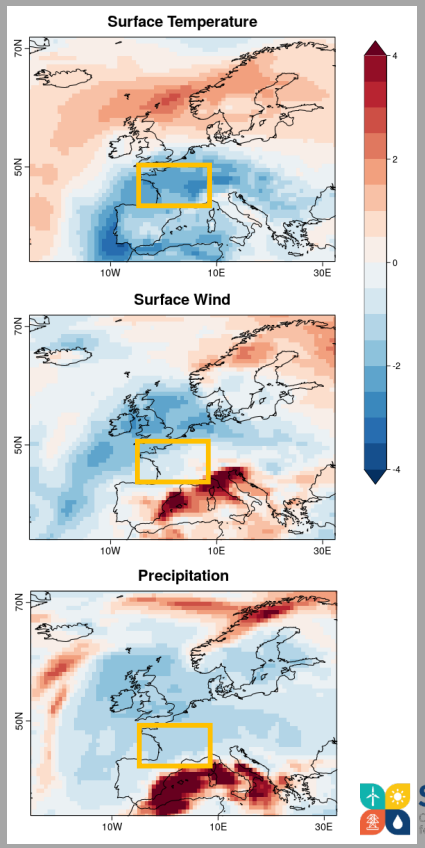
Acosta-Navarro et al. (2018)

Peak energy demand - France winter 2016-17



RTE (2016)

Cold spell + Lower-than-normal resources
for renewable energy production
France third week Jan 2017



S2S4E Climate Services for Clean Energy

Pechlivanidis et al. (2018)

- Suggests that a **high reduction of Arctic sea ice has favoured a record-breaking low precipitation and wind speed** over parts of western Europe
- **Contributes to understand the linkages** between the Arctic and mid-latitudes
- Once better understood, future forecasts of extremely low sea ice extent (that also relate with forecasts of electricity demand and supply) could be **potentially valuable for adaptation and for assessing risk for the European energy systems**

WHAT CAN THE SEA ICE FORECASTING COMMUNITY LEARN?

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- Frame research in the right way to **provide solutions** to real-world challenges
- Provide information that answers the **needs of stakeholders** (timely, in adequate format, etc.)
- Develop **skills to communicate** scientific results to people beyond academia

Taking our knowledge to society: The case studies

The case studies focus on **extreme events of Arctic weather and climate** on different time scales, and their **impact on a specific aspect of society or daily life** in the Arctic and beyond. **Severe Weather Europe** has a good collection and documentation of unusual weather events in Europe. Visit the APPLICATE website for examples of case studies done by the project so far.

- **Renewable energy**
- **Health in the Arctic**
- **Safety/Insurance issues in the Arctic**
- **Biodiversity and conservation**
- **Local infrastructure**

> ***"Having to explain my work to someone else helped me to have a clearer idea of what I was doing and why and see how this work could also be useful for society"***

Thank you!

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Blog Polar Prediction Matters: https://blogs.helmholtz.de/polarpredictionmatters/

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S2S4E
Climate Services for Clean Energy

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APPLICATE USER GROUP

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Participant	Organisation	Areas of expertise
Ian Laing, Executive Director	Institute of the North, Alaska, USA	Economic and resource development, policy, responsible land management
Veronica Slajer, Director	North Star Group, Alaska, USA	Social performance, community engagement, sustainable development
Cindy Dickson, Executive Director	Arctic Athabaskan Council, Canada	Indigenous and local communities, Arctic Policies through Arctic Council
Justin Kim, Director	Korean Maritime Institute (KMI), Korea	Maritime affairs, Research and Policy
Michael Kingston, Director	Michael Kingston Associates, UK	Insurance, legal affairs, IMO Polar Code, Arctic Council PAME Arctic Marine Best Practice Forum
Anders Oskal, Director	International Centre for Reindeer Husbandry, Norway	Reindeer herder, reindeer herding international cooperation
Mikhail Pogodaev, Deputy Minister	Sakha Republic Government, Russia	Regional cooperation in the North, Reindeer husbandry, indigenous and northern communities
Mead Treadwell, President	Treadwell Development, Alaska, USA	Arctic Investors, policy shaper
Dr. Zhang Beichen / Cheng Wenfang	Polar Research Institute of China (PRIC)	Research (research stations and vessels), international science cooperation
John Wardman, Science Specialist	AXA XL, UK	Insurance

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Guidelines for Asking Questions

Questions will be addressed during the question and answer session following the presentations.

Joining by Zoom: type your questions into the chat window at any time. I will read them aloud.

Joining by YouTube Livestream: type your questions in the “live chat" window. A facilitator will share your questions with me to read aloud.

Joining by Phone: you will need to raise your hand by pressing *9 — and unmute yourself by pressing *6 to ask your question aloud.

For technical support, contact Kuba Grzeda via Chat or email, kuba@arcus.org.

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Regional ice information product user needs

- ***Key user identified priorities***
  - Information (ice chart & ice forecast) related to use of coastal ocean/ice during freeze-up period
  - Slush ice vs. sheet ice during freeze-up
  - Coastal ice berms
  - Landfast ice thickness
  - Ice stability & trafficability
- ***Potential observation/prediction variables***
  - Mixed layer supercooling
  - Surface wind stress (slush vs sheet ice)
  - Wave height
  - Onshore component of ice convergence
  - …

Photo: Billy Adams, Utqiaġvik, 18 Nov 2019 arctic-aok.org

Photo: Billy Adams, Utqiaġvik, 7 Dec 2019 arctic-aok.org

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Thank You!

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We will notify the community when it is available.

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