

# July 2023 Q2 Reporting Compiled Summary Statements

## Priority Area 1: Community Resilience and Health

**Goal: Improve community resilience and well-being by strengthening research and developing tools to increase understanding of interdependent social, natural, and built systems in the Arctic.**

**Objective 1.1: Support the health of Arctic residents through research on public health needs, disparities, and delivery.**

**Deliverable 1.1.4 Along with local health partners, conduct research to support understanding and awareness of emerging zoonotic disease threats identified in the CDC's One Health Zoonotic Disease Prioritization for Alaska workshop report. Agency: DOI-USGS, DOI-FWS, HHS-CDC, HHS-LEA**

### Summary Statement for 1.1.4

The US Geological Survey (USGS), along with collaborating partners, continues to investigate the level of harmful algal bloom (HAB) toxins throughout the food web in the Bering Strait Region. In March 2023, researchers from the USGS Alaska Science Center presented at a Bering Strait Science workshop on the level of toxins present in both die-off and live seabirds.

Additionally, USGS continues to research avian influenza among wild birds and mammals; in April 2023, researchers from the USGS Alaska Science Center presented on highly pathogenic avian influenza during the Strait Science Workshop series, which is hosted by the Alaska Sea Grant Northwest Campus. This presentation provided community members with information about the historical context for avian influenza as a wildlife disease, a summary of ongoing outbreaks of highly pathogenic avian influenza (HPAI) among wild birds and mammals at various spatial scales, and how to identify and report sick animals. The HAB and HPAI information provided by USGS is critical for those who utilize birds as a subsistence food source. The US Fish and Wildlife Service has also continued to support increasing understanding and awareness of emerging zoonotic disease threats. In 2022, the U.S. Fish and Wildlife Service (USFWS) developed its Zoonotic Disease Initiative, which is a grant program focused on wildlife disease prevention and preparedness. The Alaska Native Tribal Health Consortium (ANTHC) was one of the recipients of this grant and has recently initiated several activities to advance their goal of increasing

surveillance capacity of the priority zoonotic diseases (identified in the CDC's One Health Zoonotic Disease Prioritization for Alaska workshop report) in rural Alaska and improving tribal health system preparedness regarding these zoonotic diseases. The continued research of emerging zoonotic disease threats, by agencies such as USGS and USFWS,, has increased the understanding and awareness of these threats, which is critical to decrease potential health risks associated with zoonotic disease in Arctic communities, particularly among subsistence users.

Relevant links:

USGS HAB presentation for Strait Science: <https://www.youtube.com/watch?v=zxfmf62xj1A>

USGS HPAI presentation for Strait Science: <https://www.youtube.com/watch?v=eTi4Z4BNOxA>

**Deliverable 1.1.5 Along with collaborating partners, investigate human illness associated with harmful algal blooms (HABs), and develop and distribute preventive messaging based on what is learned. Agency: HHS-NIEHS, DOI-USGS, EPA, HHS-CFSAN/OFS, HHS-NCEZID, NOAA, USDA**

**Objective 1.2: Address emerging threats to food safety and access, as well as food and nutrition security in the Arctic, through research that addresses how climate and environmental change is affecting the abundance, accessibility, and use of traditional foods and traditional ways of life.**

**Deliverable 1.2.2 Provide funding opportunities and conduct studies on the impact of harmful algal blooms (HABs) on availability and safety of traditional and commercial foods. Agency: NSF, DHS-USCG, DOI-FWS, DOI-USGS, EPA, HHS-CFSAN/OFS, HHS-CFSAN/ORS, MMC, NASA, NOAA-NCCOS**

Summary Statement for Deliverable 1.1.5 and 1.2.2

The US Geological Survey (USGS), along with collaborating partners, continues to investigate the level of HAB toxins throughout the marine food web across Alaska, including the Bering Strait Region. In March of 2023, researchers from USGS presented results at a Bering Strait Science lecture series on the level of toxins present in both die-off and live seabirds. Additionally, the Bureau of Indian Affairs continues to provide partnership funding to the Knik Tribe for the sampling and testing for paralytic shellfish poisoning at six Alaskan communities along with funding for any needed public outreach. Both USGS and NOAA have hosted meetings on harmful algal blooms in the first half of 2023. The Alaska HAB workshop, hosted by NOAA, brought together 60 collaborators across all impacted sectors within Alaska. It provided information on the impacts of HABs on food security for subsistence hunters as well as further information on monitoring methods and potential funding sources for monitoring of HABs. In June of 2023, USGS hosted a meeting on saxitoxins in subsistence harvested seabirds along with collaborators at NOAA, the AHAB network, the U.S Fish & Wildlife Service, the Norton Sound Health Corporation, UAF Sea Grant, the Alaska Department of Health, Woods Hole Oceanographic Institute, and the USGS National Wildlife Health Center. The workshop was focused on what is known about saxitoxins in Alaskan seabirds, how those results might inform

risks of encountering saxitoxins in harvested birds, and next steps for development of public messaging around HAB toxins in seabirds. The continued research and monitoring of HABS along with outreach in the form of collaborative workshops and presentations with many Alaska stakeholders, advances knowledge and public safety for subsistence users.

<https://kniktribe.org/paralytic-shellfish-poisoning-in-alaska-2/>

<https://coastalscience.noaa.gov/news/harmful-algal-bloom-workshop-focuses-on-alaskan-coastal-communities/>

<https://www.usgs.gov/centers/alaska-science-center/science/harmful-algal-bloom-toxins-alaska-seabirds>

**Deliverable 1.2.3 Conduct research and produce a report on seabird mortality events in the Bering Sea, including severity, causes, and ecological implications. Agency: DOI-USGS, DOI-FWS, DOI-NPS, NOAA**

Summary Statement for 1.2.3

As part of the 2023 Arctic Report Card, NOAA along with collaborating partners produced a peer-reviewed chapter on seabird die-offs in the Bering and Southern Chukchi Sea region. In addition to federal agency authors, co-authors included university collaborators as well as Indigenous authors. The chapter highlights the geographical extent and magnitude of seabird die-offs which is only possible through monitoring by a dedicated network of Tribal, State and Federal partners. One key finding was the sixth consecutive year of higher than expected seabird die-offs.

**Deliverable 1.2.5 Conduct investigations and report on trends in abundance, distribution, and condition of ice-dependent marine mammals in the Bering, Chukchi, and Beaufort seas to identify and forecast changes that may impact food security and the long-term sustainability of traditional food supplies. Agency: NOAA Fisheries, DOI-FWS, DOI-USGS**

Summary Statement for 1.2.5

Multiple collaborative efforts have been undertaken to investigate and report on trends in abundance, distribution, and condition of ice-dependent marine mammals in the Bering, Chukchi, and Beaufort seas. Recent collaborations have focused on Pacific walrus population dynamics and behavior, as well as polar bear behavior and changes in habitat.

USGS, USFWS, and Alaska Native hunters conducted a series of research cruises from 2013-2017 to study Pacific walrus population dynamics. In 2023, they will initiate a second series of walrus research cruises. Data collected will eventually be combined into one population model to estimate Pacific walrus population abundance, survival, and population trend.

USGS Alaska Science Center collaborated with the USGS Upper Midwest Environmental Science Center and Alaska Department of Fish and Game to evaluate effects of vessel exposure on Pacific walrus behavior. Researchers were able to suggest a conservative buffer to maintain

between vessels and areas of high use by foraging walrus, but further studies on behavioral consequences of closer proximities between walrus and vessels are needed.

Scientists from Colorado State University, USGS Alaska Science Center, and USDA National Wildlife Research Center evaluated whether biological and time-varying environmental variables thought to influence polar bear movement also drive decisions to swim ashore when sea ice is seasonally absent from the Beaufort Sea continental shelf. Results suggest that storm events (i.e., sustained high wind speeds) may force bears from degraded ice habitat and catalyze seasonal movements to land. The study provides a window into emergent, climatically mediated behavior in an Arctic marine mammal vulnerable to rapid habitat decline.

Ultimately, findings from these collaborative efforts studying walrus and polar bear populations will help partners better identify and forecast changes that may impact food security and the long-term sustainability of traditional food supplies.

Relevant links:

Vessel Cruise for Estimates of Pacific Walrus Demography:

<https://www.usgs.gov/centers/alaska-science-center/science/qa-vessel-cruise-estimates-pacific-walrus-demography>

Presentation – Pacific Walrus Research in the Bering Strait Region: Abundance and Population Dynamics: <https://www.youtube.com/watch?v=3valfdY5kIE>

Taylor, R.L., Jay, C.V., Beatty, W.S., Fischbach, A.S., Quakenbush, L.T., Crawford, J.A. 2023.

Exploring effects of vessels on walrus behaviors using telemetry, automatic identification system data and matching. *Ecosphere* 14(3):e4433 <https://doi.org/10.1002/ecs2.4433>

Kellner, A., T.C. Atwood, D.C. Douglas, S.W. Breck, and G. Wittemyer. 2023. Sea ice concentration and wind speed drive timing of ice departure in a newly migratory polar bear population.

*Ecosphere*, <https://doi.org/10.1002/ecs2.4420>

**Objective 1.3: Provide research and technical support for water and sanitation infrastructure.**

**Deliverable 1.3.1 Synthesize and expand upon existing efforts to create data visualization maps of areas at high risk for coastal erosion, permafrost thaw, and flooding within specified future time periods (e.g., 10 years, 50 years, 100 years) to identify at-risk areas and inform investments in climate resilient infrastructure. Agency: DOI-USGS, NASA, DOD-USACE, FEMA, NOAA**

[Summary Statement for 1.3.1](#)

The US Geological Survey (USGS) internally funded pilot project “Building a Coastal Flood Hazard Assessment Tool with at-Risk Alaska Communities” aims to (1) map past and future coastal flood hazards due to sea level rise and extreme water levels driven by plausible future storms and changing sea ice conditions at 3 coastal communities, and (2) to develop web-based and stakeholder – appropriate tools, that inform local community planning and improve science collaboration among Federal, state, and regional partners for enhanced pre-storm preparations, post-storm recovery, and long-term planning. Thus far USGS has completed initial in-person community meetings in Unalakleet and Elim in February 2023, with initial meetings in Utqiagvik scheduled to occur August 1. The Coastal Resilience CoP hosted a discussion of this USGS project in its May 15 meeting with Li Erikson and Dee Williams. It is expected that for each village, 30 to 60 flood hazard maps will be produced (based on various scenarios). On April 26 in collaboration with the Arctic Coastal Observations, Research and Networking (ACORN) seminar series, the Permafrost CoP hosted a seminar focused on a recent field study to better understand drivers and magnitude of groundwater discharge along the Beaufort Sea coast of Alaska. The activities reported here demonstrate progress on this deliverable and help increase understanding of drivers impacting climate-resilient infrastructure.

<https://www.iarpcollaborations.org/members/events/23941>

<https://www.iarpcollaborations.org/members/events/23986>

**Deliverable 1.3.2 Develop a publicly accessible database for information on drinking water contaminants (including PFAS) and effective treatment processes. The database will be of use to water treatment operators, regulatory agencies, researchers, and treatment process consultants and designers. It could also support responses to emergency contamination events. Agency: EPA**

Summary Statement for 1.3.2

EPA’s Drinking Water Treatability Database was updated to include 54 PFAS chemicals from 183 sources. The database provides information on best practices and technologies for PFAS treatment in drinking water. Information on cost models for PFAS treatment in drinking water was also generated.

**Deliverable 1.3.3 Support research on the feasibility of PFAS treatment for surface water and groundwater in the Arctic. This will help inform a strategy on PFAS remediation of contaminated sites. Agency: EPA**

Summary Statement for 1.3.3

On June 28, 2023, EPA announced over \$278 million in funding across several programs to improve access to safe and reliable drinking water and wastewater services for American Indian Tribes and Alaska Native Villages. The funding will help Tribes and Alaska Native Villages make significant investments in water infrastructure improvements to advance public health protections by improving compliance with existing water regulations, identifying and replacing lead service lines, and addressing harmful emerging contaminants in drinking water and

wastewater, such as per- and polyfluorinated substances (PFAS). For the first time, EPA will provide \$38.6 million to address emerging contaminants, including PFAS, in drinking water systems serving Tribal populations. This includes an implementation manual for the new program that focuses on assisting small tribal public water systems in identifying and/or remediating challenges related to PFAS and other emerging contaminants. \$39.6 million in funding will support Alaska Native Villages with the construction of high priority drinking water and wastewater facilities in rural Alaska as well as training, technical assistance, and educational programs in support of sustainable water systems.

<https://www.epa.gov/newsreleases/biden-harris-administration-announces-over-278-million-funding-improve-water>

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## Priority Area 2: Arctic Systems Interactions

**Goal: Enhance our ability to observe, understand, predict, and project the Arctic's dynamic interconnected systems and their links to the Earth system.**

**Objective 2.1: Advance understanding of Arctic amplification and the associated connections with lower latitudes.**

**Deliverable 2.1.1 Provide funding opportunities for investigator-driven modeling and observational studies that focus on the following aspects of Arctic Amplification: (1) ice-albedo feedback; (2) impacts of atmospheric and oceanic circulation on Arctic Amplification; and (3) transport of heat, moisture, and pollutants between Arctic and lower latitudes. Share knowledge and synthesize results arising from these studies.**

**Agency: DOE-SC, NSF, DOD-ONR, NASA, NOAA**

### Summary Statement for 2.1.1:

Many agencies (NSF, DOE, ONR, NOAA) have projects that are funded in FY23 and beyond are listed on agency webpages. Some examples are copied below (in the details section).

Additionally, NSF had an IARPC webinar this year that highlighted Funding Opportunity Announcements. The observational campaigns, modeling projects, and process studies all enhance Arctic predictability. NASA's observational campaign on Arctic Radiation-Cloud-Aerosol-Surface Interaction Experiment (ARCSIX) was highlighted by discussions through Atmospheric CoP.

In addition to the funded projects, many synthesis activities that focus on Arctic predictability like Sea Ice Prediction Network (SIPN) have posted highlights on the IARPC website. SIPN, has

posted June predictions and is also advertising the July call for predictions. The joint Modeling and Physical Oceanography CoP highlighted activities that were funded through DOE, NASA, NOAA, ONR, when they hosted the 2-hour townhall discussion on model biases in the Arctic ocean. Some scientific results have also been highlighted as publications that are jointly funded across agencies on the IARPC website.

Many funded investigators from the various agencies are also hosting sessions at the AGU 2023 Fall Meeting that will highlight important results from the various projects.

Details:

*NSF project funding information:*

- NSF 23-572 – New Solicitation! o Target Dates Added for Arctic Natural Sciences and Arctic Social Sciences Programs (Mid-January and Mid-July of each year). All other programs remain no deadline.
- IARPC Public Webinar Series: National Science Foundation Arctic Sciences Section Office Hours
- Additionally NSF awards can be found on <https://www.nsf.gov/awardsearch/simpleSearchResult?queryText=Arctic> and sorting through them one can get an idea of Arctic Amplification relevant projects

*DOE Projects:*

1. High-Latitude Application and Testing of Earth System Models (HiLAT-RASM) Science Focus Area is teaming up with the Regional Arctic System Model (RASM) project to study transport, exchange, and feedback processes that contribute to Arctic amplification and its global impact (PIs: Wilbert Weijer, Hailong Wang and Wieslaw Maslowski).
2. InteRFACE: Interdisciplinary Research for Arctic Coastal Environments project aims to improve fundamental understanding of change in Arctic coastal systems (PIs: Joel Rowland, Diana Bull, Ethan Coon, Hajo Eicken, Andrew Roberts, Scott Rupp, Stephanie Waldhoff).
3. Improving Projections of AMOC and Collapse Through Advanced Simulations project aims to increase our physical understanding of AMOC and how it is represented in Earth system models (PI: Luke Van Roekel).
4. Improved Coupled Climate Simulations in E3SM Through Enhanced Sea-Ice Mechanics project aims to improve the physical description and numerical computation of sea ice in the sea-ice component of E3SM model to address known challenges in sea ice modeling (PI: Deborah Sulsky).
5. ECS in Climate Models: Quantifying the Uncertainties due to Cloud Feedback Versus Ocean Heat Uptake Using a Modeling Hierarchy project aims to understand the roles of cloud feedback and oceanic adjustment (e.g., OHU and AMOC changes) in climate sensitivity (PI: Wei Cheng).
6. Refining the Representations of High-Latitude Surface-Atmosphere Radiative Coupling in the E3SM project will improve the fidelity and consistency of simulated radiative

coupling between the snow/ice surface and the atmosphere in high latitudes (PI: Xianglei Huang).

7. Extreme Moist Transport Events as a Driver of Arctic Amplification (PIs: Nicole Feldl and Hansi Singh).
8. The overall goal of the DOE Next-Generation Ecosystem Experiment in the Arctic (NGEE Arctic) is to improve our predictive understanding of carbon-rich Arctic system processes and feedbacks to climate. This is achieved through experiments, observations, and synthesis of existing datasets that strategically inform model process representation and parameterization, and that enhance the knowledge base required for model initialization, calibration, and evaluation. In October of 2022, NGEE held an initial E3SM/ELM modeling workshop for experimentalists to learn more about ELM and run land-model simulations to better understand how observations can inform modeling and to grow the ELM modeling community focused on Arctic ecosystem dynamics and connections with larger atmospheric processes

#### *NASA projects*

NASA's Arctic Radiation-Cloud-Aerosol-Surface Interaction Experiment (ARCSIX) will address key questions regarding the interactions between clouds, aerosols, meteorology and sea ice, as driven by solar radiation and radiation emitted from the Earth's surface. The experiment's primary field campaign will be based in Thule, Greenland and make measurements over the Arctic Ocean. Primary observations will include cloud properties, aerosol particle properties, meteorological parameters, presence/absence and properties.

#### *Additional information:*

- Sea Ice Prediction Network (SIPN) team members announce the call for contributions for the 2023 Sea Ice Outlook (SIO) July report.
- Call for Contributions to the 2023 SIO July Report
- Now Available: 2023 June Sea Ice Outlook Report
- Panel discussion on sea ice prediction
- Statistical Models in Arctic Sea Ice Prediction - Modelers Community of Practice March 2023 Meeting
- AGU sessions:
- Call for abstracts: "Predictions and Predictability in the High Latitude Climate System", AGU Fall 2023 Session C033
- A relevant paper reported to IARPC (ONR, NOAA)
- The Role of the Russian Shelf in Seasonal and Interannual Variability of Arctic Sea Surface Salinity and Freshwater Content (Hall, S.B., Subrahmanyam, B., & Steele, M.)
- Hall, S. B., Subrahmanyam, B., & Steele, M. (2023). The role of the Russian Shelf in seasonal and interannual variability of Arctic sea surface salinity and freshwater content. *Journal of Geophysical Research: Oceans*, 128, e2022JC019247. <https://doi.org/10.1029/2022JC019247>



**Deliverable 2.1.2 Hold workshops and webinars and produce publications to encourage interagency research coordination on Arctic Amplification. Agency: DOE-SC, DOD-ONR, NASA, NOAA, NSF**

Summary Statement for 2.1.2

IARPC webinars hosted by several CoPs have become effective venues to highlight results on Arctic Amplification and Arctic Change. For example, the IARPC Modelers CoP have held meetings focused on the Polar Amplification Model Intercomparison Project (PAMIP) in April 2019 and response to AA and its physical mechanisms in May 2022. In the most recent meeting (on April 27, 2023), Modelers CoP invited Nicole Feldl (University of California – Santa Cruz) and Ivy Tan (McGill University) to present their recent studies of AA from a modeling perspective, with a unique focus on identifying significant physical processes and feedbacks involving sea ice, moisture and cloud ice nucleation.

The IARPC Atmosphere CoP highlighted an observational campaign (ARCSIX) as part of their webinar series. To better understand processes relevant to Arctic Amplification, NASA is gearing up to execute an airborne investigation out of Thule Greenland in late spring/summer 2024. This project, known as the Arctic Radiation-Cloud-Aerosol- Surface-Interaction Experiment (ARCSIX), will feature multiple aircraft as well as surface- and satellite-based sensing platforms to collect detailed information on the atmosphere, specifically including aerosols and clouds, and their combined radiative impacts at the surface. ARCSIX has three primary goals, including: Understanding how coupling between radiative processes and sea ice properties influence summer sea ice melt understanding processes controlling the predominant Arctic cloud regimes and their properties, and improving our ability to monitor Arctic cloud, radiation, and sea ice properties and processes from space.

On January 5, 2023, the Physical Oceanography CoP discussed water mass changes and transformations in the Arctic Ocean. Understanding two-way interactions between the Arctic and low latitudes is critical for our ability to project the evolution of the Arctic Earth system and impact on global climate. Additionally they hosted a session on biases in the Arctic Ocean that brought together scientists from different modeling centers. The hope is that the initial discussion will lead to more collaborations across the many modeling centers.

**Deliverable 2.1.3 Provide opportunities to support and coordinate research to enhance the understanding of connections between Arctic and global ocean circulation with a particular focus on Atlantic Meridional Overturning Circulation. Agency: DOE-SC, NSF, DOD-ONR, DOI-BSEE, NASA, NOAA**

Summary Statement for 2.1.3

In the first six months of the BIP, two topics, both led by the Physical Oceanography CoP, initiated discussions on the connections of the Arctic ocean circulation with the lower latitudes. One of them is part of a larger webinar series that the Modeling CoP intends to host on “Biases of Earth System Models in the Arctic”. The Physical Oceanography CoP led this series with a focus on

biases related to Arctic Ocean Stratification. Essentially, layering of water masses in the Arctic matters for both local Arctic and global climate: it controls the ability of ocean heat to impact sea ice and the atmosphere and hence the amplification of Arctic warming; of freshwater to reach the deep convection sites that are important for the global overturning circulation; and of nutrients to reach the photic zone and stimulate the biological carbon pump. However, Arctic Ocean in Earth System Models has biases with regards that could lead to biases in: 1) heat and freshwater exchange with lower latitudes; 2) sea ice melt and associated climate feedbacks; 3) marine ecosystems, and associated carbon uptake, etc. Our ability to confidently project the future of the Arctic Earth system depends on an accurate representation of the Arctic Ocean stratification by ESMs. In this 2-hour webinar the biases were discussed by a panel of experts from 10 different modeling groups. The initial ideas that were spurred could lead to better collaborations across the various modeling groups.

In another webinar that the Physical Oceanography CoP led, there were two presentations that focussed on water mass changes and transformations in the Arctic Ocean: One shared latest insights into the status and trends of the Arctic Ocean circulation, while the other focussed on conceptual model of the polar overturning circulations. This session contributed to the understanding of the Arctic Ocean circulation and its connections to the global circulation.

Scientists have also begun posting results of publications. One such focussed on ocean salinity and freshwater over the Arctic Ocean's Russian Shelf.

**Deliverable 2.1.4 Advance understanding of the role of atmospheric rivers in Arctic Amplification with a specific task of hosting a conference session in 2023 or 2024. Agency: DOE-SC, DOD-ONR, NASA, NOAA, NSF**

Summary Statement for 2.1.4

Although there were no specific IARPC webinars that directly focus on Atmospheric Rivers and their contributions to the Arctic Amplification, there are several ongoing and planned activities that are worth mentioning. Several AGU 2023 sessions have been proposed that could address the role of Atmospheric Rivers in affecting Arctic changes. One of our PA2 co-leads is hosting a session on Atmospheric Rivers at the US CLIVAR Summit in August 2023. The DOE HiLAT-RASM project will be presenting an overview of their work progress and objectives in an upcoming Atmosphere CoP webinar. Arctic atmospheric river research is a prominent topic in the HiLAT-RASM project.

**Deliverable 2.1.5 Hold cross-collaboration-team meetings and workshops, and produce publications, to explore the results of high-resolution and regional Arctic modeling. Meetings will focus on the importance of model resolution to capture Arctic Amplification and its relationship with the lower latitudes. Agency: DOE-SC, NSF**

Summary Statement for 2.1.5

On June 1, the Modelers CoP organized the first in a series of sessions focusing on Arctic biases in US Earth system models. The goal of this series is to bring together representatives of the modeling centers and system experts to discuss potential solutions towards reducing tenacious biases in US Earth system models (ESMs). Climate models have biases in the representation of many aspects of the Arctic Earth system (e.g., ocean stratification, clouds) that are both persistent in model generations (e.g., CMIP5 to CMIP6) and common to many models. An exchange of information, if not a collaborative effort, between the modeling centers might help to improve models and reduce these biases.

The session was co-organized by the Physical Oceanography CoP and focused on biases in Arctic Ocean stratification. The meeting brought together a dozen panelists and presenters from a range of modeling efforts and modeling centers to dig into some of the persistent issues in modeling the Arctic Ocean. There were more than 70 participants, who listened to two topical presentations, a presentation of the results of an informal model intercomparison activity that was conducted in the lead-up to this session; and a discussion among the panelists. The session already resulted in a follow-up contact between some of the model center representatives, and the hope is that it will lead to more substantial collaborative activities.

**Deliverable 2.1.6 Quantify the contributions of surface properties, clouds, aerosol particles, and precipitation to the Arctic summer surface radiation budget and sea ice melt during the early melt seasons. Agency: NASA, NOAA**

Summary Statement for 2.1.6

In its May webinar meeting (May 30, 2023), the Atmosphere CoP invited several ARCSIX investigators to provide information on this upcoming NASA field campaign. During the meeting, Patrick Taylor (NASA Langley Research Center) provided a general overview of the motivation and scientific priorities of the ARCSIX campaign. Additional topical overviews were given, including one on ARCSIX radiation science, another on ARCSIX cloud science, and yet another on ARCSIX aerosol science. Several funded projects, including the DOE HiLAT-RASM, are making progress in modeling the contributions of surface properties, clouds and associated feedbacks to the Arctic surface radiation budget and sea ice melt, which will be reported in upcoming Atmosphere and/or Modelers CoP webinars.

**Deliverable 2.1.7 Facilitate regular discussions to reflect on the diversity of those active in Priority Area 2 and on identifying ways to improve inclusivity. In addition, use the quarterly meeting to consider what has worked well, as well as suggest changes and implement actions to better address barriers to diversity, equity, and inclusion in Priority Area 2 activities. Agency: NSF, NASA, NOAA**

Summary Statement for 2.1.7

1. On March 15, the IARPC Diversity & Inclusion Community of Practice held a session that focused on how to integrate equity and inclusion—two of the new Arctic Research Plan’s “Overarching Principles”—into different group activities. This meeting was specifically for

leaders of collaboration teams and communities of practice (i.e., not open to the public);

During this event, D&I Team:

- Introduced IARPC leaders to some questions for discussion about diversity and inclusion (D&I) goals within your group.
- Provided a space for beginning to plan on how to implement D&I practices within your groups.
- Solicited feedback on potential topics of interest for collaborative events with the Diversity & Inclusion Community of Practice

In addition to helping each team determine D&I goals for their group, the outcomes will hopefully create promising IARPC Collaborations practices and opportunities for shared learning.

2. NASA's Cryospheric Sciences program co-sponsors a meeting annually with researchers from the Greenland glaciology community; several key goals of this meeting include how to "decolonize" U.S. research in Greenland to better include local communities in research activities, changing the focus of the community to build on a collective/collaborative future versus the historic norm of competition for siloed projects, and how to organize/advocate for institutional support to achieve the DEI goals of the research community.

**Objective 2.2: Observe, understand, predict, and project Arctic ecosystem change and its impacts on humans and the entire Earth system.**

**Deliverable 2.2.2 Carry out and synthesize research and monitoring needed to improve understanding of important Arctic ecosystem processes and feedbacks. This will include responses to environmental changes, such as the associated impacts on wildlife and human communities and infrastructure. This work will include conference sessions and scientific publications. Agency: DOI-USGS, DOE-SC, DOI-BLM, DOI-BOEM, DOI-FWS, DOI-NPS, NASA, NSF, USDA-NRCS, USDA-USFS**

#### Summary Statement for 2.2.2

The Terrestrial Community of Practice had a meeting to discuss ecosystem processes and feedbacks. Dr. Adrianna Foster described recently published work on a Multi-Disturbance Synthesis of Arctic and boreal regions of North America. This research opened the discussion for the team to consider how to contribute to reducing uncertainties in Arctic and boreal processes. They also held a meeting regarding the NASA Arctic-Boreal Vulnerability Experiment (ABoVE) Research Highlights and Future Plans. ABoVE Science Team leader Dr. Scott Goetz provided an overview of research highlights from the campaign including new research to shrink uncertainty in modeling carbon emissions, constructing biomass maps, understanding greening and browning using remote sensing technologies, and understanding hazards in Arctic and boreal regions. On April 12th, 2023, the Marine Ecosystems Community of Practice hosted an event on Salmon and Coastal Systems featuring a presentation from Dr. Ed Farley (NOAA) on Salmon Research in Alaska and how the results from those studies help to inform differences in stock returns of

sockeye and chum salmon. The CoP held a robust discussion relating to these facts led by Craig Cythlook (UAF) regarding community information needs to ensure stocks remain healthy. On June 22, the Modelers and Terrestrial Ecosystems Communities of Practice met to hear presentations on the seasonal forecasting of Arctic Wildfire conditions. The discussion focused on the use and limitations of seasonal forecasting systems –particularly limitations in the predictability of precipitation; the application and availability of data to stakeholders, and the Alaska lightning detection network.

A paper entitled "Climate policy must account for community-specific socio-economic, health, and biophysical conditions - evidence from coastal Alaska" (by Tobias Schwoerer et al.) was recently published in *Regional Environmental Change*. The paper documents the impact of coastal storms on socio-economic and psychological livelihood as well as relocation preferences. The findings underline the community's preoccupation with coastal storms, enhanced by climate change.

The Marine Ecosystems Community of Practice hosted an Arctic Marine Synthesis event on June 14, 2023 to inform the community about some ongoing synthesis projects. These projects will update our collective understanding of the Arctic marine ecosystem and make important progress towards improving capacity to forecast future conditions.

A publication by coauthors from the University of Colorado–Boulder, U.S. Geological Survey, National Center for Atmospheric Research, and National Park Service combines the longest (> 60 year) river discharge records on nine Alaska rivers and climate reanalysis data to understand changing river conditions. The paper documents the magnitude of change in discharge and the dominant factors controlling these changes. The data and findings across a wide range of climate and hydraulic conditions may be useful for extrapolating across the Arctic to inform how rivers will continue to be altered by climate change.

**Deliverable 2.2.4 Continue coordinated interdisciplinary Arctic marine climate and ecosystem observations, and share data and promote synthesis of field observations.**  
**Agency: NOAA-OAR, NSF, DHS-USCG, DOI-BOEM, DOI-FWS, NASA, NOAA Fisheries**

#### Summary Statement for 2.2.4

IARPC agencies have continued support of coordinated climate and ecosystems research observations as described in the 2023 vessel matrix. This includes coordinated synthesis work including that which is supported by the North Pacific Research Board's Integrated Ecosystem Research Program focusing on synthesizing years of ecosystem research in the Arctic. IARPC hosted a discussion on Harmful Algal Blooms (HABS) in the Arctic and how to communicate those to Alaskan communities and reports from community observers on board research vessels. The Field Operations Community of Practice also compiled and shared resources on how to promote safe and inclusive environments in Arctic research. The Field Operations Community of Practice also plans to share a mooring location matrix that was discussed in its April meeting and has also received an update on the International Arctic Buoy Program.

The ocean economy, also known as “blue economy”, plays a pivotal part in Alaska’s economy as well as the entire nation. Recently the Arctic has experienced rapid environmental changes, such as decline of sea ice content and increase of ocean acidification, which could impact Alaska’s blue economy. The Physical Oceanography Community of Practice invited two experts to their March 2, 2023 meeting who presented perspectives on Alaska’s blue economy and Macroalgae Research Inspiring Novel Energy Resources (MARINER) program.

The Marine Ecosystems Community of Practice hosted an Arctic Marine Synthesis event on June 14, 2023 to inform the community about some ongoing synthesis projects. These projects will update our collective understanding of the Arctic marine ecosystem and make important progress towards improving capacity to forecast future conditions.

On May 10, 2023, the Marine Ecosystems Community of Practice hosted an International Observing event. Jackie Grebmeier provided highlights of international projects related to pan-Arctic marine ecosystem observing and future plans that were presented during the annual Arctic Science Summit Week held in February 2023 in Vienna, Austria. Lee Cooper and Karen Frey, U.S. Delegates to the International Arctic Science Committee (IASC) Marine Working Group, shared the results of recent international cooperation.

**Deliverable 2.2.6 Continue support for research programs that document Arctic marine species distribution, abundance, biodiversity, health and condition, foraging ecology, demography, habitat use in the Arctic, and basic life history information as well as age and growth rates of key links in the food web. Agency: DOI-USGS, DOD-ONR, DOI-BOEM, DOI-FWS, MMC, NASA, NOAA, NSF**

#### Summary Statement for 2.2.6

The 2023 Pre-field season meeting led by the Field Operations CoP was held on May 25, 2023 in collaboration with the Sea Ice and Marine Ecosystems CoPs. The meeting provided an overview of vessel-based research cruises taking place in 2023 and provided space for PIs and participants to share opportunities for collaboration on the cruises and share community engagement plans. USGS Alaska Science Center and Upper Midwest Environmental Sciences Center research wildlife biologist William Beatty will be co-principal investigator on a Pacific walrus research cruise on the RV Norseman II, which occurred from June 5 - July 2, 2023. In collaboration with the Eskimo Walrus Commission and the U.S. Fish and Wildlife Service (USFWS), the overall goal of the research cruise is to collect data to study Pacific walrus population dynamics. USGS crews will collect information on the age structure of the walrus population while USFWS crews will collect biopsies from walrus hauled-out on sea ice. Three Alaska Native walrus experts from St. Lawrence Island will be on board the cruise vessel to advise on walrus behaviors, environmental conditions, and travel in sea ice. Data collected will eventually be combined into one population model to estimate Pacific walrus population abundance, survival, and population trend. On May 10, 2023, the Marine Ecosystems Community of Practice hosted an International Observing event. Jackie Grebmeier provided highlights of international projects related to

pan-Arctic marine ecosystem observing and future plans that were presented during the annual Arctic Science Summit Week held in February 2023 in Vienna, Austria. Lee Cooper and Karen Frey, U.S. Delegates to the International Arctic Science Committee (IASC) Marine Working Group, shared the results of recent international cooperation.

**Objective 2.3: Understand interactions between social, ecological, and physical Arctic systems, particularly in the context of coastal, climate, and cryospheric change.**

**Deliverable 2.3.1 Observe, understand, and model processes to manage and mitigate potential and realized threats from coastal invasive species, biotoxins, and wildlife diseases on animals and human populations via existing research networks and initiatives, publications, participation in scientific meetings, and public engagement. Agency: HHS-NIEHS, DOI-BOEM, DOI-FWS, DOI-USGS, MMC, NOAA**

Summary Statement for 2.3.1

This deliverable had only one report during the past quarter. The USGS reported on a recent study on parasites affecting Alaska brown bears. The agency felt that this study provides an important baseline for researchers to assess changes through time and relative to ecological alterations. Thus, this directly addresses the ecological Arctic change (wildlife diseases) component of the 2.3.1 deliverable. Please see the USGS IARPC report dated 4/14/2023.

**Deliverable 2.3.2 Through conference sessions, scientific publications, and IARPC Collaborations meetings, highlight results from missions that contribute to long-term observations of land ice. Agency: DOI-USGS, NSF**

Summary Statement for 2.3.2

This deliverable had one report during the past quarter. A joint NASA and NSF meeting was held on the topic of the Future of Greenland Ice Sheet Science (FOGSS). While this was the second annual event with this title, it builds off the early NASA PARCA and NSF GEOSummit workshops, some of which date back to 1995. This is a critical, annual meeting for bringing together Arctic cryosphere researchers, who provide input on the current state and future research goals, primarily for the Greenland Ice Sheet. Thus, this directly addresses the physical Arctic (land ice) change component of the 2.3.1 deliverable. Please see the NASA IARPC report dated 3/27/2023.

**Deliverable 2.3.4 Integrate information from field, laboratory, and remote sensing studies to examine and quantify relationships among surface topography, vegetation composition, hydrology, disturbance effects (including fire, thermokarst, land use change, and wildlife), geophysical processes in permafrost soils, and humans. Share results in reports, presentations, and scientific publications. Agency: DOI-USGS, DOE-SC, DOI-NPS, NASA, NSF, USDA-NRCS**

#### Summary Statement for 2.3.4

This deliverable had 6 reports during the BIP Y1 Q1 reporting period. However, one report was associated with a team meeting that didn't address the deliverable and one report is associated with a future event: The USGS will host a permafrost workshop, September 19-21, 2023, in Golden, CO, to bring together researchers and identify ways to collaborate. One workshop session will be specifically devoted to assessing how to advance IARPC BIP deliverables. On 3/23/23, the Terrestrial CoP hosted a webinar (reported 7/11/23) to discuss ecosystem processes and feedbacks; the discussion included recent research and conversations on how the community could contribute to reducing uncertainties in Arctic and boreal processes. On 4/20/23, the Terrestrial CoP hosted a webinar (reported 7/11/23) that covered 2 semi-related topics (reported 7/11/23): the NASA ABoVE mission and the Alaska Fire Consortium. The ABoVE presentation spanned the applications, including mapping biomass and understanding hazards in Arctic and boreal regions. The Alaska Fire Consortium presented heavily on tools in fire management. And the USGS reported on a recent study on detecting previously undocumented wildfire events in Alaska. These elements are directly relevant to deliverable 2.3.4, as they demonstrate how scientists are applying a spectrum of methods to look at all aspects of surface change.

**Deliverable 2.3.5 Better understand the rate of terrestrial and subsea permafrost degradation and their roles in environmental and ecosystems processes and services (e.g., atmospheric and terrestrial carbon, Arctic greening, species invasion) by integrating empirical information into modeling efforts at various scales and delivering results via publications and presentations. Agency: DOI-USGS, DOE-SC, DOI-NPS, NASA, NSF, USDA-NRCS**

#### Summary Statement for 2.3.5

This deliverable had 5 reports during the BIP Y1 Q1 reporting period. However, one report is associated with a future event: The USGS will host a permafrost workshop, September 19-21, 2023, in Golden, CO, to bring together researchers and identify ways to collaborate. One workshop session will be specifically devoted to assessing how to advance IARPC BIP deliverables. On 3/23/23, the Terrestrial CoP hosted a webinar (reported 7/11/23) to discuss ecosystem processes and feedbacks; the discussion included recent research and conversations on how the community could contribute to reducing uncertainties in Arctic and boreal processes. On 4/20/23, the Terrestrial CoP hosted a webinar (reported 7/11/23) that covered 2 semi-related topics (reported 7/11/23): the NASA ABoVE mission and the Alaska Fire Consortium. The ABoVE presentation spanned the applications, including mapping biomass and understanding hazards in Arctic and boreal regions. The Alaska Fire Consortium presented heavily on tools in fire management. And the USGS reported on a recent study on changing river discharge on nine Alaska rivers; the study may be a useful tool to inform how rivers will continue to be altered by climate change. These elements are directly relevant to deliverable 2.3.5, as they demonstrate how scientists are measuring and monitoring permafrost degradation and associated landform change.



**Deliverable 2.3.6 Foster continued efforts to link multi-agency investments while expanding empirical datasets and synthesizing information that will inform the development of updated essential variable maps for Alaska, Greenland, and the circumpolar Arctic (e.g., permafrost ground ice content, topography, bathymetry, vegetation). Agency: NSF, DOE-SC, DOI-BLM, DOI-NPS, NASA, NOAA, USDA-NRCS**

Summary Statement for 2.3.6

This deliverable had 5 reports during the BIP Y1 Q1 reporting period. However, one report was associated with a team meeting that didn't address the deliverable. On 5/9/23, a permafrost webinar series hosted a discussion (reported 7/12/23) on mapping total biomass using interdisciplinary methods, including field observations, Landsat satellite imagery, and ancillary databases. On 3/23/23, the Terrestrial CoP hosted a webinar (reported 7/11/23) to discuss ecosystem processes and feedbacks; the discussion included recent research and conversations on how the community could contribute to reducing uncertainties in Arctic and boreal processes. On 4/20/23, the Terrestrial CoP hosted a webinar (reported 7/11/23) that covered 2 semi-related topics (reported 7/11/23): the NASA ABoVE mission and the Alaska Fire Consortium. The ABoVE presentation spanned the applications, including mapping biomass and understanding hazards in Arctic and boreal regions. The Alaska Fire Consortium presented heavily on tools in fire management. These events, hosted mainly the Terrestrial CoP, are directly relevant to deliverable 2.3.6, as they demonstrate synthesis efforts to map and monitor the Arctic, with many projects focused on mutually beneficial science co-production.

**Deliverable 2.3.7 Improve high-resolution models' ability to capture coastal processes at the interface of ocean, land, and atmosphere by supporting targeted collaborations among model developers, users, and decision-makers. Products will include an interagency scientific peer-reviewed publication and conference sessions that address these models. Agency: DOI-USGS, DOE-SC, EPA, NASA, NOAA, NSF**

Summary Statement for 2.3.7

This deliverable had 3 reports during the BIP Y1 Q1 reporting period. On 6/8/23, a glacier modeler and a sociologist presented jointly (reported 6/21/23) on their research on community engagement and adaption in the southeastern United States to sea-level rise (stemming from mostly the Arctic). On 5/11/23, a geophysicist discussed her work in examining coastal response to changing Greenland ice sheet extent and volume (reported 5/24/23). And on 5/15/23, researchers specializing in modeling and remote sensing met (reported 5/30/23) to share their research in observed coastal change and prediction. The predictive element included a GIS in development to inform risk to coastal-community assets. These events, hosted by the Glaciers and Sea Level Rise and Coastal Resilience CoPs, are directly relevant to deliverable 2.3.7, as they demonstrate how scientists can measure and model sea-level-rise risk and be informative to coastal communities.

## Priority Area 3: Sustainable Economies and Livelihoods

**Goal: Observe and understand the Arctic’s natural, social, and built systems to promote sustainable economies and livelihoods.**

**Objective 3.1: Conduct and support research to foster the development of Arctic infrastructure. This includes research on improvements in community capacity and infrastructure projects that are prioritized by Arctic communities to support resilience and leverage technology in community redevelopment and relocation efforts.**

**Deliverable 3.1.1 Conduct a study to create an asset map of existing infrastructure as a baseline for understanding how to equip a community to be resilient to climate impacts. Facilitate sharing resources about and mitigation techniques for known threats to infrastructure impacted by climate change. Agency: Denali, DOE-AE, DHS, DOC-EDA, DOD-Ted Stevens, DOE-EERE, DOE-OE, DOI-USGS, DOT, EPA, HUD, NOAA, NSF, USDA-RD**

### Summary Statement for 3.1.1

1. We have held monthly team meetings to plan and discuss our work. We have established a shared drive to which we’ve uploaded documents related to: the implementation plan, monthly meeting minutes, data, research proposals, reporting, and discussions re: an Arctic Infrastructure Community of Practice.
2. Lead Erik Obrien started compiling metadata on Alaska community infrastructure datasets and has met multiple times with the State of Alaska’s Geoportal team on integrating asset mapping efforts. He has met with IARPC team members, Jonathan Blythe from BOEM and Mike Brady from the data management team on how to structure PA3’s efforts with the Alaska Geoportal. He has been working with Matt Heavner on starting with energy infrastructure as a pilot effort.
3. Co-Lead Lowe submitted a proposal and was awarded funding from the Denali Commission (with match from UAA) for a project entitled: “Technical Assistance for Alaska” that included funding for two graduate research assistants in the UAA Master of Public Policy and Administration program. Both of these students have been recruited and hired for beginning in the fall semester, Aug 2023. A Master of Public Policy student from Anchorage, AK, Ryan Witten, will work on compiling datasets for meeting the deliverables of PA3.1.1. A Master of Public Administration student from Point Hope, AK, Janelle Tingook, will work with federal partners in creating a technical assistance program for Alaska village relocation.

4. Co-Lead Orttung has drafted research proposal language for a project entitled: “Build Smart: Informing Rural Alaska Resource-Allocation Decisions Utilizing A Comprehensive Infrastructure Database.” He has been communicating with NSF program officers about the appropriate funding mechanisms for this project.
  5. Ryan Witten has proposed establishing an IARPC Arctic Infrastructure Community of Practice to:
    - Provide a clear landing place for Infrastructure related work, which naturally crosses the boundaries of the Priority Areas
    - Serve as a bridge between state stakeholders and global actors
    - Engage members of the public in a focused portion of IARPC without overwhelming them with the complexity of the IARPC Ecosystem
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## Foundational Activity: Data Management

**Data Objective 1: Encourage and implement FAIR (Findable, Accessible, Interoperable, and Reusable) and CARE (Collective benefit, Authority to control, Responsibility, and Ethics) data management principles in the Arctic.**

**DATA Deliverable 1.1 Identify verified points of contact (e.g., agency champions, data practitioners, Arctic residents, Indigenous organizations) and their areas of expertise and interests for working with the data team on exploring and implementing FAIR and CARE in Arctic data management. As part of developing the points of contact, identify and track representation across many axes of diversity (demographics, disciplines/sectors, IARPC experience, career stage, and others) to ensure a diverse and representative group of contributors. The data team will check in with these groups regularly to ensure the points of contact are up to date. Agency: DOD, Denali, DHS-USCG, DOE-SC, DOI-USGS, DOT, HHS, NASA, NOAA, NSF, SI, USDA**

### Summary Statement for Data 1.1:

The team has verified three DoD agency champions and has drafted a list of other possible champions.

**DATA Deliverable 1.2: In order to build community buy-in and promote sustained efforts, develop and revisit and update terms of reference which articulate Biennial Implementation Plan Data Management roles, activities, and metrics. Agency: DOD, DOE-SC, DOI-USGS, NASA, NOAA, NSF**

### Summary Statement for Data 1.2

The Data Management co-leads have begun a draft Terms of Reference (ToR) document, and will continue revising it in the coming months. The ToR articulates the Biennial Implementation Plan Data Management roles, activities, and metrics. The current outline has the mission statement, vision, shared values, our approach, meeting schedule and design, activities, co-lead roles, along with key terms and definitions. This document will continue to be updated and populated to be leveraged as a reference document.

**DATA Deliverable 1.3: Based on input from engagement activities, develop and update centralized documentation of thematic areas of interest, ongoing activities, and key documents and resources that can inform deliverables and future Biennial Implementation Plans. Agency: DOD, DOE-SC, DOI-USGS, EPA, NASA, NOAA, NSF**

#### Summary Statement for Data 1.3

The Data Management co-leads created a collaborative working document, regularly update it during and after meetings, and shared it via the IARPC Collaborations Data Management collaboration team page. This document streamlines the work of the Data Management FACT, facilitates transparency of the team's work, and welcomes participation of all other collaboration teams and IARPC agencies into the team's work. The Data Management FACT will continue to enable the work of the priority area goals by using this living document to open up the work of the Data Management FACT and also collate suggestions and interests from the other foundational and priority areas, as well as federal / non-federal / local partners.

**DATA Deliverable 1.4: Convene quarterly seminars, discussions, and training on FAIR and CARE data management in the Arctic. Ensure a diverse group of presenters and contributors are represented in these activities. Agency: DOD, Denali, DHS-USCG, DOE-SC, DOI-USGS, DOT, HHS, NASA, NOAA, NSF, SI, USDA**

#### Summary Statement for Data 1.4

Q2 seminar brought together 3 data management experts in a panel discussion titled "What you really need to know - A data management conversation" and was attended by ~30 participants. A Q3 seminar is planned to focus on Arctic data management education and training resources, to be led by the NSF-funded Arctic Data Center. Additionally, all team leads have represented IARPC, CARE and FAIR in a variety of fora with both federal and non-federal stakeholders.

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## Foundational Activity: Education, Training, and Capacity Building

**Edu Objective 1: Develop a ONE STEM hub.**

**Deliverable EDU 1.1: Establish a ONE STEM hub.**

Summary Statement for Edu 1.1

Progress is being made toward the One STEM hub through compilation of activities relevant to education, training and capacity building in the Arctic. We intend to create a web based site on the IARPC platform as an initial step to accomplishing a One STEM hub.

**Edu Deliverable 1.2: Provide access to STEM internships, skill development opportunities, and career pathways for those living in and/or with interest in the Arctic, in particular for rural and Indigenous communities.**

Summary Statement for Edu 1.2

Existing programs are available to those in and from the Arctic.

**Edu Deliverable 1.3: Engage in ongoing and respectful dialogue with communities about education, training, and capacity building needs. Document feedback.**

Summary Statement for Edu 1.3

Communications exist in varying capacities with communities in the Arctic.

**Edu Deliverable 1.4: Use quarterly meetings to build the STEM Education team into a robust community that supports promotion of STEM careers and skills for rural and Indigenous students.**

Summary Statement for Edu 1.4

Education FA has hosted quarterly meetings open to federal and non federal participants and in conjunction with other Collaboration teams.

Alaska Arctic Observatory and Knowledge hub

<https://www.iarpccollaborations.org/members/events/23557>

Broadening Participation through a Story-telling based Learning Cycle

<https://www.iarpccollaborations.org/members/events/23893>

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# Foundational Activity: Monitoring, Observing, Modeling, And Prediction

**MOMP Objective 1: Coordinate activities and communities of practice that bring together Arctic modeling, observing, monitoring, and prediction to advance Arctic research.**

**MOMP Deliverable 1.1: Develop synthesis products, best-estimate datasets, model simulations, and model intercomparison studies from major Arctic field campaigns and long-term observational sites to advance the integration of observational and modeling studies and process-based assessment of model simulations.**

## Summary Statement for MOMP 1.1

Long-term observational sites and major field campaigns produce a wealth of data for understanding the Arctic system. Development of synthesis data products and best-estimate data products from these activities are critical for informing process-based assessment of model simulations. During this quarter, MOMP held a collaboration team meeting in which scientists presented updates on data products and model/observation integration activities from three major field efforts (MOSAIC, ABOVE, and the DBO). These three projects cover multiple disciplinary themes and are funded by multiple different federal (and international) agencies. The presentations and discussion provided scientists across disciplines with different examples of synthesis and model-observation integration activities and encouraged sharing of information across projects and agencies.

IARPC agencies supported several activities focused on development of synthesis datasets and model-observation integration from the MOSAiC campaign. The 2nd International MOSAiC Science Conference held in Feb 2023 included a session on “Aggregated Datasets and Methods for Model Evaluation”. A session has also been submitted to the AGU 2023 Fall Meeting on “Coupled-system Processes of the Central Arctic Atmosphere-Sea Ice-Ocean System: Harnessing Field Observations and Advancing Models”. Both the MOSAiC science conference and the AGU session will bring together US and internationally-funded scientists to collaborate on data synthesis activities. The DOE ARM user facility released a synthesis best estimate cloud and radiation dataset from the ARM MOSAiC data.

The development of synthesis data products and model-observation integration datasets supports the Arctic Systems Interactions Priority Area as these datasets are the foundation of future research studies.

**MOMP Deliverable 1.3: Provide funding opportunities for research coordination between groups working on Arctic coupled data assimilation and reanalysis, emphasizing intercomparison assessments of the full atmosphere-land-ocean-cryosphere coupled system.**

### Summary Statement for MOMP 1.3

Reanalysis datasets are an important example of model-observation integration in which in situ and satellite observational datasets are assimilated by a numerical model to create a dynamically consistent dataset. A recent paper supported by NSF and using data from a variety of sources introduces a new 41-year Regional Arctic Ocean/sea ice reanalysis. This reanalysis dataset can now be used for research studies of this important region.

**MOMP Deliverable 1.5: Hold regular joint meetings of the Observing and Modeling communities of practice to better coordinate these communities of practice, bridge the communication gap between the modeling and observation science communities, and support the priority area research activities.**

### Summary Statement for MOMP 1.5

MOMPs public collaboration team meetings focus on joint activities that bring together both the Observing and Modeling Communities of Practice. On May 3, the MOMP meeting on “Synthesis Data Products and Modeling from Arctic Field Campaigns and Long-term Observational Sites” included both CPs, as well as multiple disciplinary CPs. The July MOMP meeting, which will focus on model evaluation and metrics, will also be a joint meeting.

**MOMP Objective 2: Support assessment, gaps analysis, and intercomparisons to understand observational and modeling needs in Arctic research.**

**MOMP Deliverable 2.3: Provide support and/or funding opportunities for researchers to participate in existing Arctic-focused model intercomparison projects and explore the feasibility of developing new model intercomparison projects focused on the Arctic system, its components, or its coupling with the broader climate system to understand gaps in modeling and predictability of the Arctic system. Agency: DOE-SC, NASA, NOAA, NSF**

### Summary Statement for MOMP 2.3:

Climate models have biases in the representation of many aspects of the Arctic Earth system (e.g., ocean stratification, clouds) that are both persistent from generation to generation and common to many models. The Modelers Community of Practice is organizing a series of meetings focusing on Arctic biases in Earth System models to promote an exchange of information and collaborative efforts between modeling centers to improve these biases. The first meeting, on June 1, 2023 was co-organized by the Physical Oceanography Community of Practice and focused on biases in Arctic Ocean stratification. The team has also submitted a session on Predictions and Predictability in the High Latitude Climate System to the AGU 2023 Fall meeting. This session seeks to facilitate a discussion of Arctic and Antarctic predictions, and to promote development in the application and validation of predictive models.

Bringing together representatives from multiple modeling centers will enable cross-pollination of ideas and solutions across federal agencies and result in more efficient use of government resources. Reducing biases and improving the predictive capability of Arctic models will provide more useful information for decision-makers. This activity is tied very closely to MOMP 3.1 and to the Arctic System Interactions Priority Area.

**MOMP Deliverable 2.5: Publish observing report tasked to the United States Arctic Observing Network (US AON) Board via IARPC. Agency: NSF, DOD, DOI-BOEM, DOI-NPS, DOI-USGS, EPA, HUD, NASA, NOAA, SI**

Summary Statement for MOMP 2.5

The US AON Board completed and published the report, “On the Need to Establish and Maintain a Sustained Arctic Observing Network”, requested by Congress. The report recommends a focus on:

- Support for coordinated, integrated, and sustained critical observations and infrastructure
- Development of a shared data management system that is open, easily discoverable, accessible, and usable across observing networks
- Prioritization of human and technological capacity building
- Closure of observational gaps in marine, cryospheric, terrestrial, atmospheric, and social systems for decision-making on climate resilience and national security.

The report calls for an implementation plan to outline agency responsibilities for coordination, governance, and management of a sustained Arctic observing network. It recognizes that developing and implementing a sustained U.S. Arctic Observing Network must advance the capacity for equitable engagement of Indigenous communities and Indigenous Knowledge, as appropriate, in its design and development.

The US AON Board is working with federal agencies to communicate the report and work towards implementation of the recommendations. On May 17, the US AON Board held an IARPC public webinar (<https://www.iarpccollaborations.org/members/events/23945>) to provide an overview of the report and efforts to move toward improved implementation of our national Arctic Observing Network. The US AON Board has also submitted a Town Hall proposal to the AGU 2023 Fall Meeting, “Advancing Our National Arctic Observing Network in Support of Societal Benefit - A Listening Session”

**MOMP Objective 3: Support coordination and engagement with Federal, international, and non-Federal partners who are conducting monitoring, observing, modeling, and prediction of the Arctic.**

**MOMP Deliverable 3.1: Support participation of United States researchers in international Arctic modeling and prediction efforts in order to quantify and improve the predictive**



**capabilities of Arctic models as evidenced by relevant scientific papers, presentations, and meeting sessions. Agency: DOE-SC, NASA, NOAA, NSF**

Summary Statement MOMP 3.1

Climate models have biases in the representation of many aspects of the Arctic Earth system (e.g., ocean stratification, clouds) that are both persistent from generation to generation and common to many models. The Modelers Community of Practice is organizing a series of meetings focusing on Arctic biases in Earth System models to promote an exchange of information and collaborative efforts between modeling centers to improve these biases. The first meeting, on June 1, 2023 was co-organized by the Physical Oceanography Community of Practice and focused on biases in Arctic Ocean stratification. The team has also submitted a session on Predictions and Predictability in the High Latitude Climate System has been proposed for the AGU 2023 Fall meeting. This session seeks to facilitate a discussion of Arctic and Antarctic predictions, and to promote development in the application and validation of predictive models.

Bringing together representatives from multiple modeling centers will enable cross-pollination of ideas and solutions across federal agencies and result in more efficient use of government resources. Reducing biases and improving the predictive capability of Arctic models will provide more useful information for decision-makers. This activity is tied closely to MOMP 2.3 and to the Arctic System Interactions Priority Area.

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## Foundational Activity: Participatory Research and Indigenous Leadership in Research

**PILR Objective 1: Fulfill Federal requirement to consult with Federally recognized Tribes and Alaska Native Corporations.**

**PILR Deliverable 1.2: Evaluate the Principles for Conducting Research in the Arctic 2018, and update as needed based on the evaluation.**

Summary Statement for PILR1.2

- Weekly co-lead team building and planning meetings (50 mins).
- Continued to develop plans for engaging with Alaska Native and Polar communities and leadership. We anticipate participation in the Alaska Federation of Natives (AFN) Annual Meeting (October 19-21, 2023 in Anchorage, Alaska) and Greenland Science Week in Nuuk (November 6-10, 2023) for science outreach, stakeholder meetings, and the Greenland Science Conference.

- We are hoping to have a live co-lead team meeting late September at NSF to best strategies meetings with Indigenous communities and leadership.
- Hosted PILR IARPC virtual Webinar May 18, 2:00–3:00pm (174 registered and 86 attendees; 198 views) – A Model for Equitable Arctic Research from Kotzebue, Alaska.
- Continued to drafted revisions of the IARPC Principles of Ethical Research survey (PILR 1.2) for eventual dissemination to Alaska Native leadership and communities, Federal agencies, and IHE research community.
- Met with IARPC staff to discuss survey and PRA and IRB process (May 26, 2023)
- Met with NSF leadership to consult on IRB and PRA process of survey (June 14, 2023).
- Presented IARPC Principles of Ethical Research draft survey and SHARE to IARPC Staff Group (May 1, 2023).
- Met with Early Career Community of Practice team leaders to discuss collaborative webinar focused on Deliverable PILR 2.5 for early fall 2023 (July 6, 2023).
- Met with Marine Ecosystems Community of Practice team leader to discuss webinar focused on Deliverables 3.1; 3.2; and 3.3 for early spring 2023 (July 7, 2023).

*How did objectives and deliverables advance the missions and capabilities of more than one federal agency and result in an efficient use of government resources?*

PILR 1.2 Evaluate the Principles for Conducting Research in the Arctic 2018 and update as needed based on the evaluation. This annual survey will be critical to evaluate longitudinal assessment of understanding, adoption, impacts, and potential revisions of the IARPC SHARE Principles. During Q2 the PILR team moved the survey effort forward by 1) creating a draft of the survey and 2) consulting with both IARPC and NSF leadership on process points, e.g., whether or not we need IRB and Paperwork Reduction Act (PRA) requirements.

PILR 1.2 (and 2.1; 3.4; 3.3; 3.2; 3.1; 1.3) The webinar “A Model for Equitable Arctic Research from Kotzebue, Alaska” webinar had significant attendance (174 registered and 86 attendees) and continues to have high impact viewing (198 views). The webinar featured Corina Qaaḡraq Kramer and Cana Uluak Itchuaqiyag who led an engaging and insightful discussion on their Rematriation Project and how their research actively includes the Alaskan Inuit community to jointly produce knowledge which impacts shaping of survey instrument and several deliverables.

**PILR Objective 2: Engage Arctic communities and individuals in research in a way that is meaningful to them.**

**PILR Deliverable 2.1: Create a training toolkit for scientists that can be self-guided and used as needed. Topics may include cross-cultural communication, consultation, participatory research, Indigenous Knowledge, overview of Indigenous culture groups, formal agreements, and how to contract and consult with Indigenous companies and individuals.**

Summary Statement for PILR 2.1

Leah Shizuru (intern with DOI - FWS) is creating a self-guided toolkit for scientists that will provide information on Indigenous Knowledge, co-production of knowledge, meaningful consultation & engagement and Indigenous culture groups via StoryMaps. The focal point of this StoryMap will be an interactive map that will enable users to learn more about the various Indigenous culture groups. She wants to represent co-production and Indigenous values by featuring artwork created by an Indigenous artist. She has contacted a couple of Indigenous artists to discuss this further.