Winter/Spring Q4/5 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 1.1.1: Initiate a Federally-funded project with local partners researching the feasibility and success rate in the treatment of chronic Hepatitis C in remote Arctic communities.

The Alaska Native Tribal Health Consortium conducted a feasibility project, funded by the Division of Viral Hepatitis at the Centers for Disease Control and Prevention (CDC), to that trained Community Health Care Providers to test people living in 12 remote communities of Alaska for hepatitis C virus and link people testing positive to effective treatment via telemedicine. The project was helpful to identify barriers to screening and treatment in rural areas. Next steps are to work with Tribal Health Organizations to further scale-up and incorporate the initiative into routine health practice. The initiative was presented in the LiverConnect ECHO by Alaska Native Tribal Health Consortium staff on January 23, 2024, available at the link below.

Deliverable 1.1.2: Conduct research on preventive measures for COVID-19 disease and evaluate lessons learned for future pandemic preparedness in the Arctic. Prepare a report on COVID-19 vaccine effectiveness in preventing hospitalizations specifically within Alaska.

In 2023, NIH funded a project, Alaska Native Communities Advancing Vaccine Uptake. This grant helped form a consortium of Tribal health leaders from across Alaska to better understand

vaccine attitudes, including hesitancy, and intentions, and to increase vaccine uptake in Alaskan AI/AN communities.

Deliverable 1.1.3: Continue research on air quality and human health. This will include an evaluation of outdoor air quality and health outcomes in Alaskan communities and a Federally-funded, local-partner-conducted evaluation of interventions to improve indoor air quality and decrease respiratory symptoms in children. Research will be shared and summarized in webinars, publications, and reports.

Summary Statement: NIH's National Institute of Environmental Health Sciences funded four research projects related to air quality and human health in the Arctic, including an impact assessment of flame retardant chemicals and PCBs in two Alaska Native communities on St Lawrence Island, a worker health and safety training on hazardous materials during emergency/disaster response and recovery, evaluation of how demographic factors, wildfire smoke, and other stressors during pregnancy may contribute to preterm birth, and a health education intervention on air pollution and cardiovascular health in rural/underserved schools in Alaska.

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 1.2.5: 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.

Summary Statement: The USGS, USFWS and Alaska Department of Fish and Game examined the utility of alternative environmental and ecological data in predicting trends in key polar bear population parameters that influence polar bear survival and reproductive success. Historical data on prey condition and sea ice from 2008 through 2017 were used to model body condition and recruitment of polar bears from 2018 through 2022 in the Chukchi Sea. The research provided a critical link to monitoring polar bear populations during a period when direct estimates of population size and reproductive rates were difficult to obtain due to their large home range and remote Arctic habitat. The research could provide baseline methodology for use in other large mammal species. The USGS, USFS and Polar Bears International updated a mathematical

model predicting changes in four Arctic polar bear populations. Sea ice projections based on three different greenhouse gas emission scenarios were used to examine the probability of polar bear population decline. The research demonstrated the increasing probability of declining polar bear population throughout this century. There is a critical need for intermittent review of model structures and input variables in a changing ecological landscape.

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.

In addition to the ongoing projects focusing on these aspects of Arctic Amplification, funded by the various agencies, NSF funded a new project "Atmospheric H2 in the Northern Hemisphere over the past Millennium" (Award #2243540), which will analyze molecular hydrogen (H2) in an ice core from Summit, Greenland to reconstruct atmospheric changes in H2 over the past millennium. This will be the first record of past atmospheric H2 prior to the onset of the industrial era. The results will reveal the natural variability in paleo-atmospheric H2 and how it relates to climate change. The resulting data will provide a baseline for assessing how human activities have influenced atmospheric H2 since the preindustrial era. The results of this study will inform global assessments of how the future hydrogen economy will affect atmospheric composition and climate.

Deliverable 2.1.2: Hold workshops and webinars and produce publications to encourage interagency research coordination on Arctic Amplification.

Several workshops and webinars in the past two quarters have been held to encourage interagency research coordination and increase productivity on AA topics:

- The Physical Oceanography Community of Practice hosted a webinar (11/2/2023) to highlight a new initiative, the Consortium for the Advancement of Marine Arctic Science (CAMAS). CAMAS, primarily sponsored by DOE-SC RGMA program area (as part of the HiLAT-RASM project), builds on the strong legacy of international collaborative research on marine Arctic science engendered by activities like the Arctic Ocean Model Intercomparison Project (AOMIP) and the Forum for Arctic Model and Observational Synthesis (FAMOS). CAMAS aims to advance the understanding and model representation of key marine Arctic processes that contribute to the rapid changes in the Arctic. It proposes to do so by facilitating and coordinating model/observational synthesis and model intercomparison studies, and the development of metrics that characterize key processes in the Arctic marine system. The session briefly reflected on past collaborative efforts on marine Arctic science, introduced CAMAS to the community, and provided an opportunity for the community to provide feedback.
- The first workshop of the Consortium for the Advancement of Marine Arctic Science (CAMAS) was held in Santa Fe, NM, February 14-16. The workshop attracted roughly 80 Arctic marine scientists from around the world to discuss knowledge gaps in our understanding of the Arctic marine system, and to develop collaborative projects to address these gaps. The workshop was preceded by an Early Career School that was attended by roughly 35 students and postdocs from around the world. During the school, the EC scientist learned from experts in the field of Arctic marine observations, modeling, and reanalysis, and received hands-on training in the use of a metrics package (PMP) to systematically evaluate the representation of sea ice in CMIP6 models.
- In the lead up to its 35th anniversary in 2025, the International Arctic Science Committee (IASC) and partner entities are coordinating a multi-year planning process for the Fourth International Conference on Arctic Research Planning (ICARP IV). This process will last from 2022 until 2026 and is meant to engage Arctic researchers, Indigenous Peoples, policy makers, residents, and stakeholders from around the world to collegially discuss the state of Arctic science, the place the Arctic occupies in global affairs and systems. Under this process, ICARP-IV is assembling Research Priority Teams (RPTs) on seven different topics. This meeting of the Atmosphere community of practice (1/23/2024) introduced the US Arctic Atmospheric Research community to the ICARP-IV process, and focused discussion on ICARP-IV Research Topic 1: "The Role of the Arctic in the Global System". Three speakers provided insights on the influence of atmospheric rivers slowing down the

seasonal recovery of Arctic sea ice, the influence of declining North American snow cover on Greenland Ice Sheet mass loss, and the interactions with sea ice loss and moisture increase with atmospheric energy transport, respectively. Subsequent meetings (February, March) will focus on different ICARP-IV Research Topics.

- The Sea Ice Community of Practice held a Sea Ice Coordination meeting (2/12/2024) to 1) update the community on observations and sea ice field activities planned during the 2024 season, 2) facilitate coordination of field activities (Deliverables 2.1.2, 2.1.3, and MOMP 3.2), 3) support coordinated interdisciplinary Arctic marine climate and ecosystem observations, and share data and promote synthesis of field observations (2.2.4), and 4) describe the upcoming ARCSIX project (field campaign) which will 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 (2.1.6).
- The February 2024 Physical Oceanography community meeting focused on the physics and modeling of atmosphere-ice-ocean interactions. The Arctic sea-ice extent and thickness are rapidly declining due to rising temperatures, significantly impacting the interaction between the atmosphere and the ocean. This shift is poised to greatly influence the Arctic Ocean dynamics across various scales, from large-scale circulation affected by winds to mesoscale eddies modulated by ice and even small-scale turbulence and mixing. Understanding the evolution of the atmosphere-ice-ocean interaction is key to accurately depicting the current state and predicting the future of the Arctic Ocean. The goal of this discussion was to address both the physical and numerical facets of this issue, catering to the diverse interests within our Physical Oceanography community.
- The March 2024 Physical Oceanography community meeting focused on ocean boundary layer modeling and observing. The Arctic sea-ice extent and thickness are rapidly declining due to rising temperatures, significantly impacting the interaction between the atmosphere and the ocean. This shift is poised to greatly influence the Arctic Ocean dynamics across various scales, from large-scale circulation affected by winds to mesoscale eddies modulated by ice and even small-scale turbulence and mixing. Understanding the evolution of the atmosphere-ice-ocean interaction is key to accurately depicting the current state and predicting the future of the Arctic Ocean. This meeting featured insights from two experts specializing in the oceanic boundary layer and its interactions with sea ice and the atmosphere, who highlighted the complexities of these interactions from complementary perspectives, namely from an observational and a numerical modeling point of view.

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.

In addition to workshops/webinars summarized above for Deliverable 2.1.2, the Modelers Community of Practice members organized three sessions at the Ocean Sciences Meeting 2024 that aim to foster discussion between pan-arctic, regional, observational, modeling, and societal activities in Arctic Ocean research. Changes in Arctic Ocean surface temperature, sea ice, and ocean circulation are ongoing and may have regional or global forcing, responses, and economic implications. Phenomena such as Atlantification and Pacification highlight the importance of both regional processes as well as the connection to the rest of the world's oceans. Coordinated efforts and process studies are also crucial to understand these changes and connections. The sessions attracted contributions from studies investigating small-, mesoscale, regional, or pan-Arctic domains or the subarctic-arctic connection as well as interdisciplinary studies of the atmosphere-sea ice-ocean system, chemical processes, and the ecosystem, outreach activities, and links to societal issues.

Recent research, partially funded by the DOE-SC RGMA program area as part of the HiLAT-RASM project, provides important rationale for the observed weakening or even collapse of the Atlantic Meridional Overturning Circulation (AMOC) since the 1980s. Observational studies suggested an imminent collapse of the AMOC, an indicator of an abrupt shift to a colder climate, which is similar to that in more northern regions. However, the mechanism behind this potential collapse is far from being understood. Liu et al. (2024) mimicked the forcing effect of the change in aerosol emissions from both the eastern (Asia) and western (the United States and Europe) hemispheres since the mid-1980s, which are found to be responsible for the observed weakening of the AMOC. A mechanism has been detected to explain the remote effect of the Asian forcing on the deep circulation in the Atlantic. Future changes in the AMOC depend on the details of the balance among the changes in the aerosol emissions over Asia and the western world and global greenhouse emissions. All three positively contribute to the slowdown of the AMOC during the period examined in this study. The continuation of the current trends in these emissions will push the AMOC toward the brink of collapse.

Reference:

Liu, F., Li, X., Luo, Y. et al. Increased Asian aerosols drive a slowdown of Atlantic Meridional Overturning Circulation. Nat Commun 15, 18 (2024). https://doi.org/10.1038/s41467-023-44597-x

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.

Several conference sessions were organized by IARPC members at the December 2023 AGU Annual Meeting to advance understanding of the role of atmospheric rivers (ARs) in Arctic Amplification. Research on Arctic ARs and their changes over the past four decades, funded by the DOE-SC RGMA program area as part of the HiLAT-RASM project, has recently yielded two key publications that were also presented at the AGU Meeting by an early career scientist.

1) Arctic ARs can effectively drive weather extremes and trigger subsequent impact on sea ice and climate. Given the continuous global warming and increased atmospheric moisture in the past four decades, Ma et al. (2024) sought to understand how internal variabilities of the climate system and human activities contribute to an upward trend of ARs that differs in the Atlantic sector of the Arctic versus the Pacific sector. The Interdecadal Pacific Oscillation (IPO) and the Atlantic Multidecadal Oscillation (AMO), defined by regional SST anomaly patterns, are the dominant internal modes of variability over the Pacific and North Atlantic, respectively. A shift in either oscillation can accelerate or dampen the Arctic warming and sea ice loss through the modulation of atmospheric circulation and poleward energy transport. As part of the poleward energy transport, Arctic ARs are found to vary in their occurrence frequency as the IPO and AMO undergo changes in their phase, which explains the observed spatial disparity in Arctic ARs. Climate models cannot capture the observed IPO and AMO changes and thus mischaracterize the spatial disparity. Given the strong connection between ARs and these two interdecadal modes, improving decadal prediction of shifts in the IPO and AMO may lead to a better projection of future Arctic AR changes.

2) The community has long since detected ARs using data from numerical model simulations. The use of satellite observations would have given them a real-time, global view of ARs solely based on observations, which is more desirable for taking actions to mitigate risks and damages, but such information was out of reach due to the lack of matching wind data. Now, using a novel method to approximate the 3-D wind data via satellites, Ma et al. (2023) produced a benchmark AR dataset for nearly the entire globe using satellite observations. Additionally, their evaluation of existing AR data shows that reanalysis products overestimate the frequency of precipitation produced in ARs but underestimate its intensity. As the quality of satellite observations continues

to improve, the methodology presented here can be applied to other satellite observations to develop higher resolution or higher frequency AR statistics.

References:

Ma, W., G. Chen, B. Guan, C. A. Shields, B. Tian, and E. Yanez. 2023. Evaluating the representations of atmospheric rivers and their associated precipitation in reanalyses with satellite observations. Journal of Geophysical Research: Atmospheres, 128, e2023JD038937. https://doi.org/10.1029/2023JD038937

Ma, W., Wang, H., Chen, G. et al. The role of interdecadal climate oscillations in driving Arctic atmospheric river trends. Nat Commun 15, 2135 (2024). https://doi.org/10.1038/s41467-024-45159-5

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.

The Modelers Community of Practice, in collaboration with the Atmosphere Community of Practice, organized the second in a series of discussion 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). The session on 11/7/2023 addressed biases in the representation of Arctic clouds and their impacts on the surface energy balance. The meeting opened with two thought-provoking presentations by leaders in the field of high-latitude cloud modeling. Mentimeter questions then allowed the audience to provide their opinion on the most pressing issues in the modeling of Arctic clouds. The session was concluded by a panel discussion with 8 experts in the field, each representing a different US modeling center. The discussion was far-reaching, and led to some consensus that cloud microphysics and turbulence modeling were among the biggest challenges to improving the representation of clouds in ESMs.

See also the summary of webinars, workshops and conference sessions for Deliverables 2.1.2-2.1.4 that also address this deliverable.

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.

The summary of webinars, workshops and conference sessions for Deliverables 2.1.2-2.1.5 above also addresses this deliverable. In particular, the Sea Ice Community of Practice held a Sea Ice Coordination meeting (2/12/2024) to 1) update the community on observations and sea ice field activities planned during the 2024 season, 2) facilitate coordination of field activities, and 3) describe the upcoming ARCSIX project (field campaign) which will 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.

Recent research (Lee et al., 2023), funded by the DOE-SC RGMA program area as part of the HiLAT-RASM project, assessed Arctic sea ice loss in response to a warming climate in 42 CMIP6 models, showing that individual CMIP6 simulations of sea ice depict a wide spread of biases and anomaly trends both across models and among their ensemble members. While the CMIP6 multi-model mean captures the observed sea ice area (SIA) decline relatively well, an individual model's ability to represent the acceleration in sea ice decline remains a challenge. Seventeen (40%) out of 42 CMIP6 models and 37 (13%) out of the total 286 ensemble members reasonably capture the observed trends and acceleration in SIA decline. The study introduces an emergent constraint that relates trends in ocean heat transport (OHT) to those in Arctic sea ice cover during a warming climate, but acknowledges the need for further investigation due to data limitations in the CMIP6 archive. A new model evaluation method involving the examination of OHT and its impact on sea ice decline is proposed to reduce uncertainties associated with ice-ocean feedback.

Reference:

Lee, Younjoo J., Matthew Watts, Wieslaw Maslowski, Jaclyn Clement Kinney, and Robert Osinski. "Assessment of the pan-Arctic accelerated rate of sea ice decline in CMIP6 historical simulations." Journal of Climate (2023): 1-51. [https://doi.org/10.1175/JCLI-D-21-0539.1]

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.

The January 2024 joint meeting of the Modelers and Early Career Communities of Practice focused on the future by highlighting recent graduate student papers on numerical modeling in the Arctic. This meeting recognized the need for student and early-career involvement in IARPC, and the important role of early-career scientists in developing future directions in Arctic research. The following presentations were made, which were from student papers given at AGU's 2023 December Meeting.

- Arctic ecosystem modeling: What role can paleo history play in reducing model uncertainty? - @Hannah Mevenkamp, University of Alaska-Fairbanks.
- Enhancing Resolution of Sea Ice Concentration with Machine Learning in the Northern Sea Route – @Maria Luísa Rocha Santos da Silva, Brown University.
- Modeling water and sediment transport in Arctic river deltas to estimate fluxes to the coast – @Claire Hines, Penn State University.
- Increasing importance of North American sourced moisture for Arctic summertime water vapor feedback – @Ian Baxter, Univ. California-Santa Barbara.

There were question-and-answer sessions and discussion for each of these presentations, and about the general experience of presenting at AGU.

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

Deliverable 2.2.1: Advance capacity to better understand, quantify, and predict methane emissions from permafrost changes in the Arctic through international collaborations.

A presentation about enhancing the E3SM Land Model simulation of pan-Arctic methane demonstrated attempts to bridge the gaps between the remote sensing mapping community and the modeling community and between the fine-scale processes and coarse-scale modeling capability. Specifically, by leveraging the available NGEE-Arctic measurements from multiple representative sites and the PDG satellite data products that capture the rapidly changing permafrost landscapes, we will enhance the ELM's representation of permafrost wetland hydrobiogeochemistry to improve simulations of pan-Arctic methane emissions.

The October 2023 Technology and Permafrost team meeting focused on the measurement of methane emissions as an area of interest and critical in understanding the impacts and feedbacks of changes to permafrost in a warming Arctic. This meeting brought together researchers from the U.S., Canada, and Europe for three presentations on advances in technology for the

measurement of methane emissions. A discussion was held after the presentations on the needs and priorities for future technology development involving the observations of methane emissions in the Arctic.

A number of new NSF awards were made to PIs studying characterizing climate change feedbacks in Arctic ponds while incorporating next-generation technologies and Arctic field experiences in education; recent changes in Arctic biogenic sulfur aerosols from a central Greenland ice core; predicting micro- to macro-scale hot-spot and hot-moment dynamics in Arctic tundra systems; and the extent of flooding and impacts on plant communities and ecosystem function following Typhoon Merbok in coastal western Alaska.

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.

The Terrestrial Ecosystems Community of Practice held a webinar on vegetation mapping efforts in Alaska. We started with a presentation by Elizabeth Powers describing the Alaska Geospatial Council's plans to develop a statewide suite of vegetation mapping products for Alaska. Matt Macander provided an overview of his team's NASA ABoVE vegetation mapping project in Alaska and how his methods will be utilized for the statewide vegetation mapping initiative. Then, the Terrestrial Ecosystem Community of Practice (TECP) co-leads discussed the outcomes of a recent USGS permafrost workshop and their plans to host a broader permafrost-vegetation-disturbance workshop in Alaska in 2024.

The November 2023 Terrestrial Ecosystems community meeting hosted representatives from different archive centers holding Arctic and boreal terrestrial datasets in a panel discussion. The panel focused on best practices for archiving data and the FAIR aspects of data archiving (Findability, Accessibility, Interoperability, and Reuse). The discussion also prioritized new insight on data access across centers and data processing with new ML tools and cloud processing tools.

Deliverable 2.2.3: Develop and update meaningful products for delivering findings and information concerning key climate features, including the annual release of the peer-reviewed Arctic Report Card on the current state of the Arctic relative to the historical record.

In November 2023, IARPC held a public webinar on the Fifth National Climate Assessment (NCA5): the preeminent source of climate information in the United States. Led by the U.S. Global Change Research Program and written by over 500 experts, NCA5 describes the observed and projected impacts of climate change on a range of sectors and ten regions of the U.S. The report assesses the latest science on adaptation and mitigation, includes new chapters on economics and social systems and justice, and explores a number of cross-cutting themes such as western wildfires and COVID-19. Equity and justice are emphasized across all chapters.

The December 2023 Marine Ecosystems community meeting discussed tracking ship activities in the Central Arctic Ocean and its marginal seas in relation to changing environmental conditions and future fishing potential for the high Arctic ecosystem.

Deliverable 2.2.4: Continue coordinated interdisciplinary Arctic marine climate and ecosystem observations, and share data and promote synthesis of field observations.

The Post-Field Season Meeting of the Field Operations Community of Practice in January 2024 featured short talks from recent research expeditions and observing networks focused on the 2023 field season including first impression of the marine environment, early findings, and challenges and success. Discussion and questions and followed talks. Through this meeting we aimed to improve collaboration among Arctic researchers and observers and expand communications and coordination with local and Indigenous communities.

The December 2023 Marine Ecosystems community meeting discussed tracking ship activities in the Central Arctic Ocean and its marginal seas in relation to changing environmental conditions and future fishing potential for the high Arctic ecosystem.

The November 2023 Field Operations community meeting aimed to provide an overview of current initiatives to build early-career leadership in sea-going Arctic research, improve safety and inclusivity on research vessels, and increase safe and responsible maritime activities in the Bering Strait through the sharing of real-time weather reports and vessel locations.

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.

The December 2023 Marine Ecosystems community meeting discussed tracking ship activities in the Central Arctic Ocean and its marginal seas in relation to changing environmental conditions and future fishing potential for the high Arctic ecosystem.

NOAA Fisheries marine mammal biologists plan to conduct an aerial survey in April 2024 to count ribbon, spotted, ringed, and bearded seals in the U.S. waters of the Bering Sea. The goals are to estimate the abundance of these species and understand how they are responding to changes in the sea ice conditions. Scientists from NOAA Fisheries' Alaska Fisheries Science Center and the Cooperative Institute for Climate, Ocean, and Ecosystem Studies would like to collaborate with coastal communities of the Bering Sea to identify Alaska Native subsistence hunters who can participate with us on the survey flights.

The Marine Mammal Commission funded research on two arctic marine mammal research projects during 2023 on topics of (1) optimizing body condition evaluation in two beluga whale populations using subsistence harvest skin and blubber samples (2) and determining the relationship between prey, body condition and pregnancy in bowhead whales to predict the effects of climate change.

The USGS Alaska Science Center, US Fish and Wildlife Service and Alaska Department of Fish and Game published a paper in the journal Ecological Indicators using environmental and ecological data to estimate the body condition and recruitment of polar bears in the Chukchi Sea during 2018-2022 when polar bear data collection was not possible due to poor spring sea ice conditions.

2.2.7 Produce and support publications and data products enhancing understanding of the linkages among marine species, oceanographic and sea ice conditions, and climate change. Specifically improve understanding of mechanisms that affect trends in trophic interactions, abundance, distribution, vital rates, and behavior.

The December 2023 Marine Ecosystems community meeting discussed tracking ship activities in the Central Arctic Ocean and its marginal seas in relation to changing environmental conditions and future fishing potential for the high Arctic ecosystem.

The USGS Alaska Science Center, Environment and Climate Change Canada, Washington State University, and Alaska Department of Fish and Game measured the energy expenditure,

behavior, diet, movement, and changes in the body composition of 20 polar bears on land near western Hudson Bay, Canada. The results confirm that increased land use by polar bears will negatively affect body condition with subsequent effects on reproduction and survival in areas on land where marine mammal prey are inaccessible.

The USGS and U.S. Fish and Wildlife Service have refined tools for heat stress detection in Pacific salmon with ~95% accuracy. A biomarker is measured in the lab from a small piece of tissue that can be non-lethally collected from salmon and works much like a test from a medical or veterinary setting, interpreting the result as 'normal' or 'abnormal'.

The USGS Alaska Science Center, the U.S. Forest Service, and Polar Bears International updated a polar bear model (now version 3.0) and compared predictions of global polar bear population status among four circumpolar Arctic regions. Consistent with the previous two versions of the model, the new forecast finds that polar bears will continue to experience increasing probability of declining or greatly declining populations throughout the 21st century, but with some variation by greenhouse gas emission scenario. The findings continue to inform priorities for inventory, monitoring, and research needs for both the U.S. Fish and Wildlife Service and the Bureau of Land Management.

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, biotoxicoses, and wildlife diseases on animals and human populations via existing research networks and initiatives, publications, participation in scientific meetings, and public engagement.

The National Institute of Environmental Health Services reported that they have 3 research projects that address this deliverable. These projects include: 1) “Hazardous Materials Worker Health and Safety Training” which provides training to protect workers and communities from exposure to hazardous materials and hazardous waste, to prevent, prepare for, respond to and recover from emergencies/disasters, and to create pathways to careers in the environmental field and construction industry; 2) “Restoring Northeast Cape for the Health and Well-Being of the Yupik Communities of St. Lawrence Island, Alaska” which addresses the concerns of the Yupik people of St. Lawrence Island who are disproportionately affected by hazardous contaminants from formerly used defense sites; and 3) “Prevention of Paralytic Shellfish Poisoning in

Subsistence Shellfish Harvest Communities of Southeast Alaska" which seeks to prevent paralytic shellfish poisoning among subsistence harvest communities in Southeast Alaska.

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.

Researchers from University of Colorado and the USGS reported on a project that addresses this deliverable. This team examined the dynamics of aufeis (also known as icings and forms when groundwater flows to surface during the winter and freezes), how sensitive this ice is to subsurface and surface characteristics, and how aufeis formation may be affected by climate change.

NASA reported on a project that addresses this deliverable. NASA's Earth Information System (EIS) project is designed to assess the impacts of climate change and other impacts from human activities on rapid changes in Earth's systems.

A couple of meetings were held between October 2023 and March 2024 that address this deliverable:

1) Jason Briner (University at Buffalo) presented on the recent Workshop on Greenland Ice Sheet Stability during a recent Glaciers & Sea Level Community of Practice meeting;

2) Joe MacGregor (NASA GSFC) shared information about the Future of Greenland Ice Sheet Science workshop and reports that the FOGGS team has prepared a white paper discussing meeting findings and goals.

Deliverable 2.3.3: Develop and assess ice sheet models for better prediction of sea level rise.

NASA reported on a project that addresses this deliverable. NASA's Earth Information System (EIS) project is designed to assess the impacts of climate change and other impacts from human activities on rapid changes in Earth's systems.

The NSF reported on the funding of 6 projects that address this deliverable:

1) "Sustained observation and study of the rapidly evolving Arctic Ocean environment" is a project that deploys autonomous, expendable instrument systems that sample the sea

water temperature and salinity of the upper ocean, continuing an observational record initiated in 2004.

2) "What's Past is Prologue: Seamless Assimilation of Past Observations into Simulations of Future Ice Sheets" is a project that will adapt state-of-the-art computational methods from applied mathematics and computer science to assimilate many different types of observations into ice sheet models.

3) "Disentangling runoff- and Terminus-driven Velocity Variations of Fast Flowing Outlet Glaciers" is a project that seeks to address three key motivating questions: (Q1) How does runoff affect outlet glacier flow over timescales of hours to years?; (Q2) How does glacier geometry affect the response to runoff?; and (Q3) How do runoff- and terminus-driven velocity variations interact?

4) "Drivers and Biogeochemical Implications of Saltwater Intrusion Along Arctic Coastlines" is a project to will provide baseline understanding of the physical, biological, and chemical processes occurring along rapidly changing Arctic coastlines.

5) "Understanding surface-to-bed meltwater pathways across the Greenland Ice Sheet using machine-learning and physics-based models" is a project that plans to use deep learning, an artificial intelligence algorithm, to find the locations of cracks and draining lakes in satellite imagery to better understand the formation of these features on the Greenland Ice Sheet.

6) "Sediment and Stability: Quantifying the Effect of Moraine Building on Greenland Tidewater Glaciers" is a project to determine if the deposition of sediment at the ice-ocean boundary is responsible for the observed variability in glacier retreat.

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.

Four meetings were reported on that addresses this deliverable. 1) The USGS hosted a permafrost workshop in Golden, CO from September 19-21,2023, to bring USGS scientists together to share their permafrost related work and identify ways to collaborate. 2) Terrestrial Ecosystems Community of Practice held a webinar on vegetation mapping efforts in Alaska and heard updates from the Alaska Geospatial Council and the NASA ABoVE vegetation mapping project. 3) The Terrestrial Ecosystems Community of Practice held a meeting in January 2024 on microbial ecology in permafrost systems and heard updates from the USGS and Lawrence Berkeley National Laboratory. And 4) The Terrestrial Ecosystems Community of Practice held a panel in November 2023 to discuss best practices for archiving Arctic and boreal terrestrial datasets using FAIR practices (Findability, Accessibility, Interoperability, and Reuse).
The NSF reported on the funding of 5 projects that address this deliverable:
1) "UAV-Based Radar Suite for Bulk-Snow Characterization and Risk Management" is a project that equips a small unmanned aerial vehicle (UAV) with an advanced radar suite to produce fine spatial and temporal resolution measurements of snowpack properties such as snow depth, snow water equivalent, relative density, and liquid water content.
2) "Do large recent wildfires in the Yukon River Delta alter the delivery of black carbon to the Arctic Ocean?" is a project to determine whether recent wildfire activity in the Delta leads to increased amounts of dissolved black carbon along the Yukon River and estuary to the coastal Arctic Ocean.
3) "The role of capillaries in the Arctic hydrologic system" is a project that will produce a pan-Arctic map of the capillary hydrological system and in selected areas, advance understanding of how the capillary system has changed over time.
4) "The Role of Ice Sheet Instability in Marine Carbon and Nutrient Cycling in the Eurasian Arctic" is a project that will help us understand how glacial instability impacts ecosystems and ocean chemistry, with potential implications for future changes in Greenland and the Canadian Arctic.

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.

Four meetings were reported on that addresses this deliverable. 1) The USGS hosted a permafrost workshop in Golden, CO from September 19-21,2023, to bring USGS scientists together to share their permafrost related work and identify ways to collaborate. 2) Terrestrial Ecosystems Community of Practice held a webinar on vegetation mapping efforts in Alaska and heard updates from the Alaska Geospatial Council and the NASA ABoVE vegetation mapping project. 3) The Terrestrial Ecosystems Community of Practice held a panel in November 2023 to discuss best practices for archiving Arctic and boreal terrestrial datasets using FAIR practices (Findability, Accessibility, Interoperability, and Reuse). And 4) In January 2024, there was a presentation entitled: "Permafrost Discovery Gateway Webinar: Bridging the Gap: Enhancing E3SM Land Model Simulation of Pan-Arctic Methane."

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).

Two meetings were reported on that addresses this deliverable. 1) Terrestrial Ecosystems Community of Practice held a webinar on vegetation mapping efforts in Alaska and heard updates from the Alaska Geospatial Council and the NASA ABoVE vegetation mapping project. And 2) The Terrestrial Ecosystems Community of Practice held a panel in November 2023 to discuss best practices for archiving Arctic and boreal terrestrial datasets using FAIR practices (Findability, Accessibility, Interoperability, and Reuse).

NASA reported on the SnowEx campaign, which is a multi-year field experiment that includes extensive surface-based observations to evaluate how to best combine different remote sensing technologies to accurately observe snow throughout the season in various landscapes.

The NSF reported on the funding of 2 projects that address this deliverable:

1) "Follow the Water: Understanding River Discharge Dynamics in Rapidly Changing High Northern Latitudes" is a project that will measure multiple components of the water cycle in permafrost watersheds across a range of glacial coverages (including glacier free) in Greenland.

2) "The Past, Present, and Future of Boreal Fire Feedbacks" is a project that spans many timescales and pushes computing powers to the limit and will inform expectations of the future for this biome and the planet.

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

NASA reported on a project that addresses this deliverable. NASA's Earth Information System (EIS) project is designed to assess the impacts of climate change and other impacts from human activities on rapid changes in Earth's systems.

The NSF reported on the funding of 3 projects that address this deliverable:

1) "Assessing the Causal Influence of Atmospheric Opacity and Sea Ice on Arctic Warming in a Novel Circulation-controlled Framework" is a project focused on what has and will control Arctic warming from 1980 to 2060.
2) "Atmospheric controls of moisture extremes over Greenland" is a project to assess whether low frequency, high-latitude circulation variability is sensitive to multiple processes, including anthropogenic, remote, and local climate forcings.
3) "Microstructure Observations of Vertical Mixing and Heat Fluxes from Chipods Deployed on Arctic Observing Network Cruises" is a project that will use an existing dataset of turbulence observations to understand whether warming of Arctic waters is associated with ocean mixing, to identify regional patterns in mixing, and to quantify changes in recent years.

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.

What do we know now that we did not before?

Identifying actionable infrastructure and institution data is difficult to obtain due to fragmentation and compartmentalization. This results in increased costs to acquire information to inform the livability and sustainability of Alaska Communities. A growing awareness of the problem is leading to localized efforts to collect and organize situational infrastructure, including in the regions of Western and Northwest Alaska and across sectors such as energy and transportation. NOAA potentially has a database solution that can house more sophisticated datasets through its Climate Resilience Infrastructure System (CRIS), with the potential to load the State of Alaska's Infrastructure Dashboard, a collection of state-monitored and funded infrastructure.

What new insights have emerged?

Dedicated funding and human resources are required to bring a holistic solution to bear.

How is this helping people of the Arctic?

In concept, access to information will be invaluable to communities, who will be able to compare best practices and identify deficiencies in infrastructure and institutions, and especially for development agencies, identify where investments must be made to sustain high-quality and livable communities.

Priority Area 4: Risk Management and Hazard Mitigation

Objective 4.1: Summarize currently available data and information requirements associated with hazard and risk mitigation, adaptation, and response efforts. Synthesize community-led activities and information to identify potential needs for future efforts.

Deliverable 4.1.1: Conduct a study identifying where information used in decision-making and planning can be improved through access to new or additional data sources. This study should consider a wide range of activities associated with ongoing responses to common and emerging hazards, including risk reduction efforts and emergency preparedness and response.

There has been a concerted effort amongst IARPC team members to engage with subject matter experts in both science and in Emergency Management circles to share information and better understand the challenges faced by practitioners to respond and adapt to the numerous Hazards in Alaska and the Arctic.

There have been a number of COP meetings hosted by the Coastal Resilience COP, Modeling and Terrestrial Ecosystems COP and Glaciers and Sea Level COP to share information and opportunities related to sharing and understanding data and information associated with the PA4 topics.

Additionally the PA co leads (Federal and Non-Federal) have established a webinar series aimed to connect the community that is contributing to data and tool development, which are aimed at supporting assessment, planning, and mitigation of hazards. This series of information sharing sessions also serve to identify needs of the science and end-user communities to more effectively address hazards.

Finally, members of the PA4 team are working with federal partners to develop a permafrost workshop with a focus on hazard mitigation. This workshop, if funded, would take place in the Fall of 2024.

Of note, The PA focus is new to the IARPC community which, in partnership with a limited connection between hazards research and mitigation/response, has required significant investment in building a framework for collaboration by the PA4 team. While this has resulted in a slower cadence, the development of relationships and initiation of information sharing mechanisms will go a long way to establishing capabilities for the community moving forward.

Objective 4.2: Update and improve the "Statewide Threat Assessment: Identification of Threats from Erosion, Flooding, and Thawing Permafrost in Remote Alaska Communities."

Deliverable 4.2.1: Undertake a study to identify the top 10 threats/hazards to communities and critical remote state and Federal government infrastructure in the state of Alaska that should be included in the Statewide Threat Assessment. This might include coastal and river erosion, flooding, thawing permafrost, and changes in the seasonal snowpack.

In the past year there have been a series of efforts aimed at understanding and prioritizing threats/hazards to communities and critical infrastructure with an ultimate goal of updating the Statewide Threat Assessment (STA).

There have been A couple of projects funded by federal partners. Specifically, NIEHS is supporting 4 projects investigating environmental hazards and NSF supporting one, MEGA - Mercury biogeochemical cycling and export from Greenland to the Arctic.

The Denali Commission is working with a UAF team to update the Statewide Threat Assessment. The UAF team would like to host a virtual meeting in April with stakeholders, scientists and collaborators. At this meeting the preliminary results of the interviews and re-analysis of data already on hand will be presented. Topics that will be included in the April meeting will be the timeline for the STA, discussions about which topics should be included in the STA, and discussions about data. Fire, drought and landslides have not been included previously but are threats that are being considered. Data gathering and planning for all have been increasing and with the increasing data available it may be viable to include in the next STA.

Deliverable 4.2.3: Collect and integrate disparate threat/hazard information and perform modeling and analysis to understand where natural and human-made threats and hazards pose a risk to Arctic communities.

The Denali Commission is working with a UAF team to update the Statewide Threat Assessment. The UAF team would like to host a virtual meeting in April with stakeholders, scientists and collaborators. At this meeting the preliminary results of the interviews and re-analysis of data already on hand will be presented. Topics that will be included in the April meeting will be the timeline for the STA, discussions about which topics should be included in the STA, and discussions about data. Fire, drought and landslides have not been included previously but are threats that are being considered. Data gathering and planning for all have been increasing and with the increasing data available it may be viable to include in the next STA.

Objective 4.3: Research to support more resilient and transformative infrastructure to withstand potential impacts from acute and long-term hazards, including those hazards brought about by climate change.

Deliverable 4.3.1: Conduct a study focused on expedient and enduring cold regions infrastructure, including water and wastewater, energy, and temporary and enduring structures. Results will be disseminated into a report that will identify and provide background information on the variety of available and emerging water/wastewater, energy, and structure technologies and best practices.

The Alaska District of USACE and CRREL have been awarded funding through the USACE Silver Jackets Program to create building standards for Arctic Communities—in this case Alaska villages. The building standards are focused primarily on foundational types and methods to better resist permafrost degradation, flooding, and coastal erosion.

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 1.4: 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.

Data Management in collaboration with MOMP hosted a Data Management for Physical Samples: Discovery, Integration, and Reuse of Interdisciplinary Arctic Sample Data last February 14, 2024. This meeting focused on the management of physical samples in Arctic research, emphasizing the application of FAIR and CARE principles. Speakers Kerstin Lehnert (Columbia University) and Lee Cooper & Alyne Bayrd (UMCES) shared best practices and standards for sample sharing and decision-making. The discussion also covered the importance of discovering, integrating, and reusing physical samples for interdisciplinary work, addressing various challenges and insights in data management and field sampling. The attendees developed a crowd-sourced document sharing their protocols and standards for archiving and sharing physical samples within their respective domains. Speakers shared existing projects and tools available like the Internet of Samples (iSamples) taxonomies: https://isamplesorg.github.io/models/ among others. Upcoming meeting plans include a collaboration with the Technology Collaboration Team focusing on the integration of Traditional Knowledge in GIS, an introduction to the Registry of Polar Observing Networks, and ethical data management for artificial intelligence. Together these meetings help advance the conversation around data management and uptake of FAIR and CARE principals.

Foundational Activity: Monitoring, Observing, Modeling, And Prediction (MOMP)

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.

DOE-supported researchers are organizing a model intercomparison (MIP) study based on the Cold-Air Outbreaks in the Marine Boundary Layer Experiment (COMBLE) field experiment. The MIP was accepted as a project of the Global Energy and Water Exchanges (GEWEX) program, Global Land-Atmosphere System Studies (GLASS) Panel. https://www.gewex.org/comble/ The intercomparison focuses on cold-air outbreak (CAO) events observed over the Norwegian Sea. Despite the frequent occurrence of Arctic CAOs, numerical weather prediction models often have difficulty representing the convective boundary layer structure and turbulence, as well as mixed-phase cloud properties. Moreover, earth system models face similar challenges with respect to predicting mixed-phase cloud feedbacks and equilibrium climate sensitivity. Multiple modeling groups are participating in the study using either large-eddy simulation models or Earth system models in single column mode. Initial results were presented at the 2023 American Geophysical Union (AGU) Fall Meeting

(https://agu.confex.com/agu/fm23/meetingapp.cgi/Paper/1373594) and the 2024 American Meteorological Society (AMS) Annual meeting (https://ams.confex.com/ams/104ANNUAL/meetingapp.cgi/Paper/438738).

MOMP Deliverable 1.2: Support development of metrics that measure key Arctic processes and implementation of these metrics in benchmarking packages to facilitate model validation against observations.

Collaboration between DOE and NASA-supported researchers is leading to development of improved metrics and benchmarking packages from recent observations. A new publication in Nature Climate Change compiled eddy covariance and chamber observations and used a causality-guided machine learning model to upscale and analyze wetland CH4 emissions. This work significantly reduced the uncertainty in high-latitude wetland CH4 emissions and provided a robust benchmark for global methane budget analysis and the development of a next-generation methane biogeochemistry model (https://www.nature.com/articles/s41558-024-01933-3). An invited presentation at the 2023 AGU Fall Meeting, "The influence of benchmark data choices on inferred model performance in the Arctic-Boreal region" used the DOE-supported International Land Model Benchmarking (ILAMB) along with new observational products from the NASA-supported Arctic-Boreal Vulnerability Experiment (ABoVE). The results highlight the influence of benchmarking choices on model evaluation and point to the need for benchmarking guidelines when assessing inferred model skill. (https://agu.confex.com/agu/fm23/meetingapp.cgi/Paper/1269811).

MOMP Deliverable 1.4: Support ongoing work, such as observing system experiments (OSEs), to quantify the current and potential value of Arctic ocean, atmosphere, sea ice, and land observations for initialized predictions spanning daily to decadal timescales.

April 2024 Summary Statement: Continued development of observing system experiment frameworks is needed to best quantify the current and potential value of Arctic observations for initialized predictions. The NASA GMAO observing system simulation experiment (OSSE) framework was recently updated and two papers were published describing the new framework and impacts of the new model. A new project is focusing on developing foundational data assimilation tools and OSSE frameworks to improve sea ice and land ice state estimate and predictive capabilities to understand the value of potential future ice topography measurements. And a recent study used an OSSE framework to demonstrate the benefits of increased CO2 sampling for detecting spatial gradients in cold season efflux and improved monitoring of rapid Arctic change. Overall, these capabilities and studies will provide important information needed for understanding the impact of future observational systems on model predictions of the Arctic system.

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.

Model intercomparison studies are an important avenue for identifying and addressing biases or gaps in understanding in Earth System Models. An important international project is the Coupled Model Intercomparison Project (CMIP), which provides a basis for IPCC reports. A recent study investigated sea ice and cloud processes that may contribute to spread in results across fully coupled models in CMIP6. In December, the Modelers' Community of Practice organized a meeting to discuss CMIP7 from an Arctic research perspective and identify how the Arctic earth system modeling community can contribute to CMIP7. IARPC researchers also participate in more focused and Arctic-specific model intercomparisons. In September, a workshop for the Warming Permafrost Model Intercomparison Project (WrPMIP) focused on the challenges and pathways for models to include permafrost processes and how experimental data from warming experiments can be used to constrain model output.

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 3.2 Coordinate communication of information about field activities to Alaska communities where the research is being conducted through the research expedition vessel status tracker and spring and fall reports on research season activities.

The Field Operations Community of Practice (FOCP) has continued its work to coordinate, update, and disseminate information related to vessel based research (the vessel matrix) and the mooring matrix to share that information with the broader community including coastal communities and Indigenous communities. The FOCP presented at an AOOS-sponsored Marine Research Planning Night Workshop at the Alaska Marine Science Symposium. The team also presented a poster at the Alaska Marine Science Symposium. Finally, the FOCP is currently updating the Vessel and Mooring matrices and plans to host the Pre-field Season Meeting on 24 April of 2024 between 1pm and 3pm EDT.

MOMP Objective 4: Support best practices in field observations and modeling.

MOMP Deliverable 4.1: Build on existing efforts within Federal agencies to share resources and implement best practices for improving field safety culture, diversity, and inclusivity, and enforcing safe working environments in the field, including both physical safety while working in harsh and remote Arctic environments and emotional safety from harassment and hostile working conditions.

The IARPC enterprise continues to put great emphasis on developing and implementing best practices for improving field safety culture, diversity, and inclusivity in field environments. The Field Operations Community of Practice includes elements of this focus area in all of its public and fed-only meetings. Recently, the Early Career and Participatory and Indigenous Led Research teams hosted a webinar on February 15 2024 that focused first on the new NSF pilot program on Safe and Inclusive Fieldwork (SAIF) and second on an example of a leading example of the implementation of Safe and Inclusive Fieldwork by Dr. Kristen Barnett of UBC. A focus on improving the safety, diversity, and inclusivity of fieldwork will continue to be a focus for the MOMP and IARPC moving forward.

MOMP Deliverable 4.3: In coordination with the Data Management foundational activity, promote and support FAIR and CARE principles for observational and modeling data.

The MOMP and the Data Management foundational activity teams have worked together to make advance progress on the implementation of FAIR and CARE principles for observational and model data. The teams hosted the first webinar that will be part of a series focused on FAIR and CARE implementation. The webinar took place on 14 February and focused on “Data Management for Physical Samples: Discovery, Integration, and Reuse of Interdisciplinary Arctic Sample Data.”