GOMO's Arctic Research Program Strategy 2022-2026

NOAA's Global Ocean Monitoring and Observing (GOMO) Program provides long-term, high-quality, in situ global ocean observations and products critical for informing and enhancing Earth system models and forecasts on daily to decadal timescales. Within GOMO, the Arctic Research Program (ARP) focuses on the Alaskan Arctic while engaging in pan-Arctic initiatives to understand the Arctic system as a whole. In this region, air temperatures have increased at a rate at least twice the global average since 2000, leading to warmer ocean waters, rapidly declining summer sea-ice conditions, younger and thinner sea ice, and rising temperatures over land. These changes have triggered a cascade of impacts that threaten the stability of Arctic ecosystems, food and cultural security of Indigenous communities, the resilience of coastal villages, and the productivity of Alaskan fisheries. Additionally, Arctic change is felt beyond the Arctic Circle to impact mid-latitude weather and climate patterns across the globe. Improving NOAA's ocean, land, and atmospheric observing systems in the Arctic is critical for tracking, understanding, and predicting threats to Alaska, the continental U.S., and the world. ARP sponsors multiple sustained, in situ ocean, sea-ice, and atmospheric boundary layer observations, and complementary marine ecosystem studies to characterize the response to climate change in the northern Bering, Chukchi, and Beaufort Seas. The ARP also supports model improvement and use supporting NOAA's mission of science, service, and stewardship.

The strategy outlined below aligns with the recommendations of the 2019 Arctic Research Program review, the 2021-2025 GOMO Strategic Plan, the 2020 - 2026 OAR Strategy, and broader NOAA Arctic strategies: NOAA's Arctic Vision and Strategy and the NOAA Arctic Action Plan .

Arctic Research Program Foci 2022-2026

Over the next 5-years, ARP will focus its efforts on sustaining long-term *Observations* and developing new observational technologies; investing in critical *Modeling* needs; increasing the availability of *Data;* supporting relevant and accessible *Products*; expanding meaningful *Engagement* with Indigenous and coastal communities in Alaska; and improving *Partnerships* across OAR, NOAA, between agencies, and internationally. These areas will allow ARP to continue fulfilling a key role across NOAA, the US Government, and the international Arctic research community while remaining flexible in responding to rapid changes within the Arctic. The following paragraphs emphasize activities already underway and areas that will see investments in over the next five years, as funding allows.

Observations

ARP will continue developing and sustaining long-term observations in the Northern Bering, Chukchi, and Beaufort Seas, focusing on sea-ice monitoring, physical oceanography, and ecosystem response. In addition, we will leverage investments by external partners to increase efficiency and maximize the impact of the science funded to meet stakeholder and mission needs. ARP's long-term focus has been on the Pacific Arctic sector, where significant U.S. interests remain and needs are growing; we will explore strategic opportunities in other areas, including the Atlantic Arctic, as resources permit.

- Facilitate coordination among NOAA observing elements by establishing a virtual collaboration structure to maximize the cooperation of long-term programs, emphasize multi-disciplinary observations and links to societal benefit areas.
- Communicate the need for sustainable access to ships and aircraft appropriate for supporting work in the Arctic, including leveraging other external and internal research programs.
- Invest in the interdisciplinary synthesis of field data from ARP research and beyond that will help advance understanding of ecosystem response to changing physical drivers in the Arctic.
- Invest in innovative observing technologies to: fill temporal and spatial gaps in ocean and sea ice-based observations, contribute to sea ice and ecosystem forecast improvements and monitor environmental changes such as ocean acidification, harmful algal blooms, and changes in ocean circulation.
- Support the work of U.S. AON and the alignment of ARP and national Arctic observing investments with Societal Benefit Areas. This will include work to elevate and socialize the value of U.S. AON to the NOAA community and strategically link US investments to those of our international partners under the Sustaining Arctic Observing Networks (SAON) initiative.

Modeling

ARP will continue to evaluate and target its support of model development and analysis activities, encouraging and facilitating coordination across OAR and other Line Offices, particularly regarding model improvements.

- Invest in model improvements focused on sea ice, ocean chemistry, and Arctic ecosystems.
- Support continued analysis of models characterizing Arctic climate changes in the Northern Bering, Chukchi, and Beaufort Seas, working closely with appropriate partner programs (e.g., National Ocean Service, Ocean Acidification Program, etc.) to ensure efforts are complementary.
- Continue investigating model-based analyses of teleconnections between Arctic change and mid-latitude extremes.

- Facilitate dialogue between modelers and observationalists to ensure maximum impact and utilization of ARP observations in models and products.
- Support activities that increase the uptake of observations by sea ice and ecosystem modeling and forecasting, particularly NOAA Unified Modeling and Forecast systems.

Data and Products

ARP will encourage activities to foster greater access and synthesis of program data, following FAIR (Findable, Accessible, Interoperable, Reusable) and CARE (Collective Benefit, Authority to Control, Responsibility, Ethics) principles. We will strengthen support for the Arctic Report Card and BAMS State of the Climate Arctic chapter production and make new investments to ensure that these products are made accessible to the public and policymakers.

- Develop and implement high standards of data accessibility and encourage the use of all FAIR/CARE principles for all funded elements through updated language in calls for proposals and work plans that emphasize compliance with NOAA's data standards and formats.
- Invest in increasing ARP data accessibility, particularly historical program data (e.g., DBO, EcoFoci, and IASOA), via commonly used tools (i.e., ERRDAP) to facilitate data product development and information synthesis.
- Facilitate closing the loop between research, monitoring, and decision-making through the support of new products to maximize the impact of ARP activities and raise the profile of Arctic research within GOMO and NOAA.
- Work with NOAA Office of Education and others to make Arctic Report Card materials accessible to schools or other public outlets.
- Ensure that ARP data and information are readily available to be distributed to Arctic communities in ways that support informed decision-making.

Engagement

ARP will develop relationships with Indigenous and other community partners in the Northern Bering, Chukchi, and Beaufort Seas regions and leverage established partnerships within NOAA and via the Interagency Arctic Research Policy Committee (IARPC). ARP will commit to the co-production of knowledge and research transparency to support decisions around community needs.

- Commit to ensuring input on new research priorities from Indigenous stakeholders.
- Begin to invest in co-production of knowledge and products to enhance understanding of the region and address community-priority questions.
- Invest in Indigenous-led research in the Bering, Chukchi, and Beaufort Seas region and support Indigenous-led contributions to the annual Arctic Report Card.

- Encourage ARP principal investigators to establish relationships within communities impacted by research and research operations, relying on existing NOAA or IARPC partnerships where possible.

Partnerships

ARP will contribute towards improved harmony and collaboration across OAR and NOAA to facilitate efficient and integrated Arctic research value chains, improving the transition of science towards better products and services.

- Establish an Arctic virtual collaboration structure to facilitate improved communication across OAR Laboratories and Programs, leading to heightened awareness of OAR's Arctic enterprise and informed leveraging of diverse projects and opportunities.
- Increase engagement with other GOMO programs (e.g., Argo, drifters, ocean carbon) and agencies to encourage coordinated ocean observing activities and infrastructure investments in the Arctic.
- Work more closely across NOAA, between agencies, and internationally to communicate program data and findings and leverage and enhance program investments throughout the Arctic.
- Identify research-to-application pathways to encourage and facilitate applications of ARP research.
- Actively engage in cross-NOAA Arctic groups (e.g., Arctic Action Team, Executive Committee, Sea Ice Working Group) to maintain situational awareness, facilitate collaboration, and leverage activities supporting OAR missions.

- *January 19, 2022*