

Arctic Test Bed and Proving Ground

Charter and Terms of Reference

I. Vision Statement

NOAA's ATPG ensures that relevant scientific and technology advances are operationalized to support the mandates of core partners with weather, water, ice, and climate information and associated impacts related to the people, infrastructure, and environment at higher latitudes as outlined in NOAA's Weather and Climate Ready Nation Initiatives.

II. Purpose

Focus NWS Alaska Region and National Centers for Environmental Prediction Ocean Prediction Center (NCEP OPC) / United States Navy Ice Center (USNIC) development efforts to maximize service delivery effectiveness for stakeholders at higher latitudes

Facilitate and improve the transfer from research to operations (R2O) of new and improved products and services that fulfill new and emerging decision-support requirements, Serve as a collaboration vehicle for developmental and Partner with, and leverage ongoing NESDIS High Latitude Satellite Proving Ground activities as well as other NOAA Test Beds and Proving Grounds to ensure efficient and timely distribution of new higher latitude related products and data to support the NWS Weather Ready Nation

Provide a platform to on-board and test R&D from external parties (e.g., Environment and Climate Canada (ECC), the Office of Naval Research (ONR) and the Naval Research Lab (NRL), etc.)

Integrate and synergize high latitude and Arctic activities among federal, state, industry and other stakeholders such as Alaska native communities and tribal councils

III. Background

The Arctic is a key region with critical influence on the global environment and economy. This has been recognized not only by NOAA but also other U.S. federal agencies as well as the White House and other Arctic nations.

Climate change is transforming the Arctic into an increasingly accessible place for economic opportunity. However, warmer air and ocean temperatures, thawing permafrost, loss of sea ice, and shifts in ecosystems are straining community resilience and presenting significant challenges to public sector decision-makers and planners. Critical environmental, economic, and national security issues are emerging, many of which have significant impacts for human lives, livelihoods, and coastal communities.

Impacts are also being studied outside the Arctic, as NOAA scientists and colleagues work to better understand the Arctic's influence on global weather and climate patterns.

In February 2011, NOAA released its Arctic Vision and Strategy, which provided an initial high-level framework to address NOAA's highest priorities in the region. Since the initial release of NOAA's Arctic Vision and Strategy in 2011, a number of Strategic documents have been released which continue to outline and update priorities and mandates to address the rapidly changing conditions at higher latitudes. This includes the White House National Strategy for the Arctic Region (NSAR) issued in May 2013, and recently updated in November 2022. This updated Strategy continues the focus to address a wide range of issues in the Arctic, including national security, transportation, sustainable development, increased maritime traffic, environmental stewardship, and research.

On January 21, 2015, the White House released an Executive Order (EO) to "Enhance Coordination of National Efforts in the Arctic." It emphasizes the importance of strengthening coordination across Federal agencies, State of Alaska, local, Alaska Native tribal governments and organizations, academia, and the private and nonprofit sectors.

The US Arctic Research Commission has issued a number of Arctic Goals and Objectives, with the latest 2023-2024 edition reaffirming specific goals areas including; Environmental Risks and Hazards; Infrastructure, Community Health and Well Being; Arctic Economics; and Research Cooperations. These are all areas where NOAA has a mission mandate to help support.

These foundational guidance documents lay the framework for NOAA's Arctic Vision and Strategy priority areas in the Arctic:

- Improvements in Sea Ice Forecast Guidance, both short term and seasonal.
- Strengthen Foundational Science to Understand and Detect Arctic Climate and Ecosystem Changes
- Improve Weather and Water, and Ice Forecasts and Warnings
- Enhance International and National Partnerships
- Improve Stewardship and Management of Ocean and Coastal Resources in the Arctic
- Advance Resilient and Healthy Arctic Communities and Economies

Addressing these priorities with good research to operations capabilities has been reaffirmed in every NOAA Arctic Report Card from 2006 to 2022 as the warming Arctic is driving shifting seasons and widespread disturbances affecting life, property and the nation's Arctic economy.

NOAA's science, service, and stewardship mission uniquely positions the agency to provide high latitude environmental intelligence (timely, reliable, and actionable information to help core partners plan for and adapt to economic and ecological

impacts, including disasters) covering a broad base of core partners from local community needs and supporting transportation logistics and state and federal government activities.

In order to transform our scientific services to meet the emerging requirements at higher latitudes, as well as enable the Alaska Region and US National Ice Center / Ocean Prediction Center to be an effective component of the NWS integrated field structure, improved focus is needed on operational science and technology advances relevant to the challenges of high latitudes. The NOAA Arctic Test Bed and Proving Ground (ATPG) has been designed to meet this gap and enable the fulfillment of NOAA's science, service, and stewardship mission at higher latitudes.

The ATPG also provides a feedback mechanism from operations to NOAA's research and development activities to address operational priorities as described above at higher latitudes. The inclusion of the US NIC/OPC into ATPG activities will enhance collaboration within the NWS and between the other NOAA line offices, especially the Office of Oceanic and Atmospheric Research (OAR) and the National Environmental Satellite, Data, and Information Service (NESDIS). This collaboration will enable better leveraging of other research initiatives, resources, and data sources.

Alaska Region NWS and the U.S. National Ice Center (USNIC) supported by the NWS Ocean Prediction Center (OPC) have a long history of an international focus with different partners addressing common service challenges, working together and leveraging opportunities (e.g., formal and informal agreements with Canada, Finland, Norway, and other international partners). A dedicated test bed provides a mechanism for collaboration, technology transfer, research activities, and observation advances into operations in a timely and effective manner.

IV. Primary Focus Areas of the ATPG

- Scarcity of *in situ* observations (e.g., wave, ocean, and ice buoys, weather observation platforms including uncrewed systems, river gauges) at higher latitudes
 - Engage in and facilitate activities to identify and address observational gaps
 - Evaluation new observation sources
- Performance concerns with weather, water, ocean, ice, and wave prediction guidance at higher latitudes compared to mid latitudes.
 - Engage in and facilitate activities to identify and address gaps in guidance at higher latitudes and in areas of complex terrain
 - Evaluate guidance and analyses to understand the strengths and weaknesses of the information and communicate this to operations and guidance developers
- The lack of maturity of tactical and medium range sea ice modeling capabilities (land fast, ice quality, etc).

- Engage in and facilitate activities to identify and address gaps in sea ice models, including coupled ice, ocean, atmosphere effects to waves, coastal erosion, and coastal ice stability
- Evaluate ice related guidance to understand the strengths and weaknesses of the information specifically as it impacts stakeholders
- Enhancing delivery of decision support services of environmental information to underserved, culturally diverse, and remote communities and understanding the needs of these communities
 - Support Service Equity activities
 - Support engagements with the communities to understand their needs and the best means to communicate environmental information
 - Develop new and improved services and tools to provide IDSS to these communities.
- Improving services in support of transportation logistics
 - Support Aviation, Marine, and land based transportation activities
 - Facilitate improvements in guidance and situational awareness tools
 - Develop new services and tools to support IDSS and forecasting activities
- Forecast process and efficiency improvement with a focus on high impact events from current time out to one year.
 - Use and communication of probabilistic forecast guidance
 - Develop new forecasting and situational awareness tools
 - Provide tools and capabilities to assess forecast performance

V. Roles and Responsibilities

A. NOAA

a. Facility

The ATPG is located at the NWS Alaska Regional Headquarters in Anchorage, Alaska. The ATPG has a dedicated physical space to conduct evaluation and development activities and dedicated computer resources. The ATPG will leverage facilities at the USNIC and NCEP/OPC to conduct remote and in person evaluation activities. Capability is available for virtual activities with remote partners internal and external to the NWS.

b. Organization

Overall responsibility for the ATPG falls under the NWS/Alaska Region Headquarters (ARH) within the Environmental and Scientific Services Division (ESSD). Day to day operations, direction, execution, and administration for the ATPG are the responsibility of the ATPG Director. Final testing, validation, and deployment of algorithms, codes, and products on operational systems will be the responsibility of the ATPG staff for operations within NWS Alaska, and with the USNIC and NCEP/OPC, or jointly between AR and NCEP/OPC as appropriate. Long-term maintenance of the new product will become the responsibility of the operational, and/or regional offices, or national centers depending on the scope of use, with scientific and technical support provided as needed by the ATPG

c. Executive Oversight Committee (EOC)

An ATPG Executive Oversight committee is composed of the Alaska Region Director, the NCEP/OPC Director, ATPG Director, USNIC Deputy Director, and two designated representatives from OAR and NESDIS knowledgeable of High Latitude and Alaska issues (e.g., CPO, STAR), and one representative from the University of Alaska. The responsibilities of the Arctic ATPG EOC include, but are not limited to:

- *ATPG director serves in ex-officio capacity*
- *Sets strategic priorities, and facilitates funding availability*
- *Oversees the scope of ATPG activities*
- *Provides input as a knowledge resource on Arctic science-based service issues to ATPG*
- *Provides guidance on testing metrics for Research to Operations (R2O) activities*
- *Oversees project selection for inclusion into the ATPG based upon recommendations by ATPG management*
- *Reviews and oversees recommendations for a capability's successful transition to operations*
- *Reviews recommendations from stakeholders for products and services that meet their needs*

d. ATPG Management Team

The Test Bed Director is a permanent, supervisory, GS-14 position on the ESSD staff, reporting directly to the Chief of ESSD. The responsibilities of the ATPG Director include, but are not limited to:

- *Provides scientific leadership and direction for all activities and programs within the test bed*
- *Ensures test bed outcomes are aligned with NWS regional and national priorities*
- *Releases Announcements of Opportunities (AOs) for projects to be considered by the ATPG. The AOs will clearly state the criteria against which the projects will be reviewed and will be guided by priorities developed by the EOC, field office needs, and resources available for a specific testing cycle. Depending on the scope of the projects, the AOs will be open to a combination of or all of the following: The U.S. scientific community including the NOAA Line Offices (LOs); Federal laboratories; Universities; and the Private sector. Partnerships with the international scientific community are also encouraged.*
- *Develops a cadre of subject matter experts to evaluate responses to AOs based upon predetermined criteria, recommending the top project candidates to the EOC for selection*
- *Represents the ATPG to the NOAA Test bed Coordinating Committee and participates in annual workshops hosted by the Coordinating Committee*
- *Coordinates with the other NOAA Test Beds and Proving Grounds,*

particularly the GOES-R Proving Ground, the Climate Test Bed, and the NWS Operational Proving Ground (OPG)

- *Coordinates support of ATPG activities through NOAA Cooperative Institutes*
- *Coordinates test bed activities with US and international Arctic-related research programs/projects, and is responsible for the resources required*
- *Manages and administers the test bed staff in a manner consistent with agency policies and guidelines*
- *Prepares the test bed Annual Operating Plan; test bed milestones, goals and objectives; review proposals; and prepare quarterly and annual reports*
- *Identifies data, forecast applications, and numerical/statistical modeling needs to accomplish appropriate transitions to operations*

Science Infusion and Technology Transfer Meteorologist (SITTM) is a permanent GS-13 position, reporting directly to the ATPG Director. The responsibilities of the SITTM include, but are not limited to:

- *As part of the ATPG management team, acts as test bed Deputy Director*
- *Assists the director in all aspects of test bed operations, and serves as Acting Director in his/her absence*
- *Provides oversight to routine ATPG activities and programs, including but not limited to experiments, training, model and ensemble post-processing and verification, and a visiting scientist program.*
- *Maintains awareness of scientific advances and new techniques being developed nationally and internationally to identify improved, real-time, data-analysis techniques, forecast models, and observational systems that have potential for significantly improving the forecast guidance provided to weather and ice forecasters in the high latitudes.*
- *Prepares or assigns ATPG related documentation including test plans, reports and science-based strategic planning*
- *Develops or integrates new data sets, tools, and concepts for examination and validation in the ATPG*
- *Assists in evaluation of data sets, tools and concepts for further testing in real-time operations, and permanent transfer into operations*

e. Other ATPG Staff

In addition to the Director and SITTM, the ATPG consists of two Research Meteorologists, and two Science Developers. Existing and supporting staff within the USNIC / OPC including the Chief Scientist, Ocean Applications Branch Chief, the Snow and Ice Product Lead and Lead Ice Specialist, will take part in ATPG efforts as needed.

Responsibilities of these staff includes but are not limited to:

- *Initial evaluation of promising observations, codes, algorithms, and*

products emerging from the research community by performing the early steps of testing to demonstrate the potential of new science and technologies for possible use in operations

- *Complete tests of the algorithms, codes, products, and observations in a quasi-operational information technology environment subject to metrics that mandate good scientific performance while meeting ease-of-use criteria and time constraints*
- *Prepare documentation, training materials, and evaluations of performance characteristics of successful products to facilitate their deployment on operational systems and their use in the forecast process*

B. External Stakeholders/participants

Participation of partners and stakeholders with a vested interest in successful outcomes from the ATPG is critical to the success of the test bed beyond traditional performance metrics. Objectives of the ATPG are focused beyond improved workflow and forecast operations to enhanced end-to-end delivery of services, measuring the effectiveness of risk communication, and improving the quality of internal and external collaboration, etc.

For instance some test bed activities may include active participation by representatives from core stakeholder agencies (e.g., United States Coast Guard (USCG), Bureau of Ocean Energy Management (BOEM), United State Geological Survey Alaska Volcano Observatory (USGS-AVO), NAIS partners, etc.), the emergency management community, media partners, and representatives from the Alaska Native communities. Other partners may include observers who bring added value to the process by offering specialized expertise in risk characterization/assessment, crisis communication skills, social science insight, and Traditional Environmental Knowledge (TEK).