



CLIMATE PROGRAM OFFICE

Arctic Research Program

Why is Arctic sea ice retreating at an unprecedented rate?

How will changes in Arctic clouds and soot alter warming trends there?

What ecosystem changes are accompanying physical changes in the Arctic?



Kathy Crane, NOAA

Polar bear on an ice floe in the Chukchi Plateau region.

The Arctic Research Program (ARP) provides support for maintaining and extending networks of climate observing systems. The observing systems measure temperatures of water, ice, and air, plus thickness of sea ice, species abundance, and biodiversity. Scientists use data from these systems to document the physical state of the Arctic Ocean, its bordering seas, and adjacent coastal areas. The data also document observed ecological responses to physical changes. The program works collaboratively with international partners to obtain observations from a suite of climate observatories around the Arctic.

ARP Objectives

- Install and maintain a suite of climate observing networks (ocean, sea ice, and atmosphere) in the Arctic.
- Generate Arctic climate datasets, support operational weather forecasts, predict the direction and speed of floating sea ice, and detect changes in ecosystem structure that could affect bird, mammal, and fish species.

- Increase understanding of processes involving ocean heat and freshwater and their sources and pathways into and out of the Arctic region, including their effect on global ocean circulation and stability of the global climate system.

Approaches

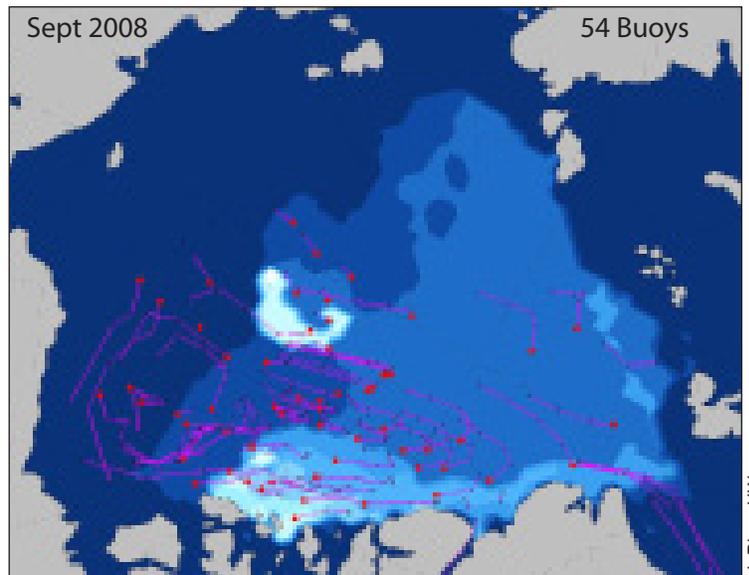
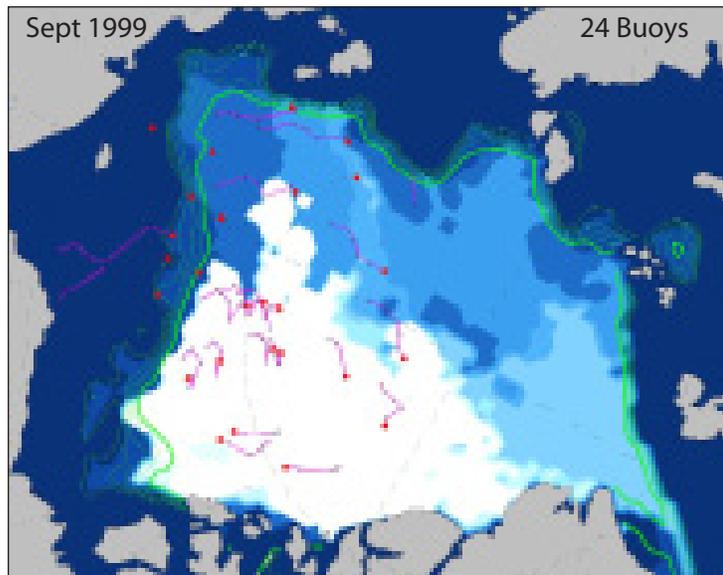
Most ARP resources support existing networks of climate observatories; the intent is to maintain observation platforms and instruments for a decade or more to obtain climate-relevant data. Specifically, the program supports:

- Atmospheric climate observatories around the Arctic rim that work to improve knowledge of clouds, aerosols, and radiation, and their impacts on climate variability and change.
- A long-term ocean and ecosystem observatory in the Bering and Chukchi Seas, an area of rapid sea ice retreat. In collaboration with Russia and the U.S. National Science Foundation, this facility observes

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Arctic Ocean Observing Buoys, 1999-2008



Over ten years, the age and thickness of Arctic sea ice has decreased dramatically. Over the same period, the International Arctic Buoy Program increased the number of active buoys from 24 to 54.

Approaches (continued)

the flow of materials and energy through the Bering Strait and surveys physical and ecological changes in the region.

- The International Arctic Buoy Program, which provides the only real-time observations of air temperature and pressure over the Arctic Ocean for weather forecasting purposes.
- A network of ice buoys that provide detailed information on sea ice thickness as well as atmospheric and ocean forcing of sea ice melt.
- Efforts to acquire and analyze climate data and model outputs to detect changes in Arctic climate. This work builds understanding of the roles of various factors that influence climate, and to evaluate the utility of climate models in describing observed changes in the Arctic.

Collaboration with Other NOAA Facilities

ARP partners with several NOAA laboratories to accomplish its mission. The Earth Systems Research Laboratory provides intellectual and technical expertise plus funding to support additional atmospheric observatories. The Great Lakes Environmental Research Laboratory is developing a modeling framework for the Bering-Chukchi Seas marine observatory. The Pacific Marine Environmental Laboratory is conducting analysis of climate data and model outputs. ARP also relies on

the Geophysical Fluid Dynamics Laboratory for constant improvement in global climate models.

ARP Highlights

International Arctic Buoy Programme (IABP)

The IABP network of automatic buoys monitors sea level pressure, surface air temperature, and ice motion throughout the Arctic Ocean. IABP participants work together to maintain the network of drifting buoys that provide meteorological and oceanographic data for operational forecasting and research purposes. Data from the Arctic buoys support international programs such as the World Climate Research Programme and the World Weather Watch Programme. Data from the IABP also benefit research in Arctic climate and climate change—they contribute to forecasts for weather and ice conditions, provide validation for satellite data, and serve as input for numerical climate models. Twenty research and operational institutions from nine countries are members of the IABP.

Partnerships

The Arctic Research Program partners with other national and international institutions to facilitate the development of a comprehensive Arctic Observing Network. Because the Arctic region is a complex system involving the atmosphere, ocean, ice, and land across international boundaries, these partnerships are essential for gathering complementary observations from this sensitive portion of our planet.