ARM
CLIMATE RESEARCH FACILITY

FACT SHEET

U.S. Department of Energy

North Slope of Alaska

The U.S. Department of Energy (DOE) Atmospheric Radiation Measurement (ARM) Climate Research Facility established climate research sites on the North Slope of Alaska (NSA), to provide data about cloud and radiative processes in cold environments and high latitudes. It is widely believed the polar regions are more affected by changing climate associated with global warming than any other area in the world. Comprehensive measurements from ARM's state-of-the-art instrument systems at these sites will help scientists improve the understanding of high-latitude cloud and radiation processes, and their representation in global climate models.

NSA Sites

Barrow – Known as the "top of the world," ARM's Barrow research site has been operating continuously since 1997. The site is located at the northernmost point in the United States—320 miles north of the Arctic Circle and a mile south of the Arctic Ocean. Many of the same instruments used at warmer ARM sites have been hardened to withstand temperatures that drop well below negative 40 degrees to operate at the Barrow site.

Atqasuk – Located approximately 70 miles south of Barrow, the Atqasuk facility began collecting data in 1999. At this inland Arctic tundra location, the climate is much more continental than in Barrow. In 2011, the Atqasuk site completed its primary science mission when it collected and archived a 10-year data set. For field campaigns or stand-alone measurements, scientists may request to use this facility through the normal ARM proposal process. All data collected from Atqasuk are available in the ARM Data Archive.

Oliktok – Located approximately 164 miles southeast of the ARM site in Barrow, Oliktok is the location of an extended ARM Mobile Facility deployment. In addition to the standard ARM ground-based instruments, ARM plans to equip unmanned aerial systems and tethered balloons with various sensors to obtain measurements of clouds, atmospheric conditions, sea ice, and heat exchange. The Federal Aviation Administration is considering supplementary airspace options that would allow additional atmospheric sampling to be conducted offshore of Oliktok, heading several hundred miles towards the North Pole. This provides a unique opportunity to couple atmospheric measurements with ground-based observations. Additional flights between Oliktok and Barrow using manned aircraft will further supplement this data set.

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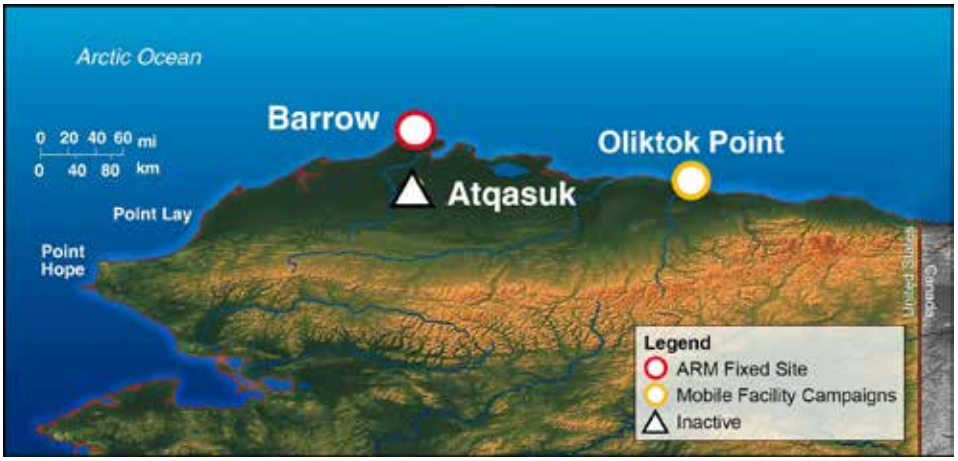

This portable, medium-range, fixed-wing Unmanned Aerial System, called Bat-3, can operate autonomously for up to 6 hours at a time, with an operational altitude of around 500 to 1500 feet above ground level. The aircraft can send and receive data up to 10 miles away.

Instrumentation and Data

Continuous data from NSA allow scientists to refine global climate change models and parameterizations for this climatically important region. Instrument systems at NSA include solar and infrared broadband radiometric instruments, a Fourier transform infrared radiometer, and about two dozen individual instruments, including cloud lidars and radars, a radar wind profiler, a radiosonde system, a sky imager, and a microwave radiometer.

Through the American Recovery and Reinvestment Act of 2009, ARM enhanced all its sites with new and upgraded instruments. Routine observations from new scanning radars greatly expanded the NSA site's ability to detect and quantify the structure, spatial distribution, and evolution of Arctic clouds and precipitation. Other new instruments close a gap in observations of surface boundary conditions and allow for characterization of the physical properties of clouds over Barrow, particularly those associated with mixed-phase clouds composed of both liquid and ice. New capabilities at NSA include:

- three new dual-frequency scanning cloud radars that provide three-dimensional information about cloud properties, including reflectivity and precipitation;
- an eddy correlation (ECOR) flux measurement system and complementary surface energy balance system (SEBS);
- high spectral resolution lidar for calibrated measurements of aerosol optical depth, backscatter, cross section, and depolarization; and
- a launching system for automated release of weather balloons, carrying radiosondes to measure temperature, humidity, and wind speed.

User Information

Researchers can use NSA's facilities and data in a number of ways:

- Access data gathered during normal operations or field campaigns through the ARM Data Archive (***http://www.archive.arm.gov/***)
- Propose and conduct a field campaign (***http://www.arm.gov/campaigns/propose***)
- Make an in-person or virtual visit to the NSA site (***http://www.arm.gov/sites/nsa/visit***).

The Atmospheric Emitted Radiance Interferometer measures the absolute infrared spectral radiance, or watts per square meter, of the sky directly above where it is placed. A custom version of this instrument, the Extended Range, or ER-AERI, was built specifically for high latitude locations like Barrow, where low water vapor concentrations are common.

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