

ARCTIC CODEL
May 8-14, 2017
Summary of the Research Sites

PURPOSE

The purpose of this CODEL was oversight of the US research investment in the Arctic region by several federal agencies. CODEL Members learned about key aspects of the US research programs that contribute to the singular depth and scope of US scientific research in the Arctic, as well as the challenges of maintaining facilities and supplying and supporting people and science in the Arctic region. In addition, the CODEL provided Members with an appreciation and understanding of US military assets in the region, including Space Command facilities in Greenland.

The research sites the CODEL visited are as follows:

UTQIAGVIK AND POINT BARROW, ALASKA

Utqiagvik (formerly Barrow) and Point Barrow enabled CODEL members to inspect and learn about several important US scientific research facilities.

- **Barrow Arctic Research Center (BARC).** Visit included a tour and briefing by leaders of the Ukpėagvik Iñupiat Corporation (UIC), which owns and operates the BARC. Two examples of BARC-hosted, federally-supported research were highlighted: NOAA’s Solar Weather Ice Monitoring System (SWIMS) and a University of Washington (UW) study of life in extreme environments (e.g., specialized microbes discovered in permafrost and Arctic sea ice). This research is relevant to exploration of extraterrestrial life.
- **Ilisagvik College in Utqiagvik.** Ilisagvik College (IC) is the northernmost institution of higher learning and the only tribal-controlled community college in the US. IC currently offers 14 associate degree programs and scores of certificate programs.

IC faculty and students are engaged in several National Science Foundation-funded projects, including “Arctic Microbes: Population Abundance and the Effects of a Warming Environment” (\$199,000, Linda Nicholas-Figueroa and Rebekah Hare); “Building Capacity in Linguistics, STEM and Technology through the Documentation of the North Slope Dialect of Iñupiaq, an endangered Native Alaskan language” (\$246,000); and “Science Symposium to engage STEM students,” a \$393,000 award from NSF’s Biological Sciences and its Education and Human Resources Directorates.

Adjacent and complementary US scientific research facilities located on Federal land near Point Barrow. These facilities include the National Oceanic and Atmospheric Administration’s (NOAA) facilities:

- **Barrow Atmospheric Baseline Observatory** is part of a global network of staffed NOAA atmospheric observatories: Point Barrow, Alaska; South Pole, Antarctica; Mauna Loa, Hawaii; Summit, Greenland; Trinidad Head, California;

and American Samoa. Clean air is of paramount importance. The Barrow Atmospheric Baseline Observatory site's is upwind of a clean-air sector that is expected to remain a clean-air sector for the foreseeable future.

- **Climate Monitoring and Diagnostics Laboratory (CMDL).** The CMDL operates the (manned) Atmospheric Baseline Observatory. The Observatory collects, analyzes, and measures changes in atmospheric climate forcing agents such as carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, climate-forcing and stratospheric-ozone depleting chlorofluorocarbons, air pollution from Eurasia known as Arctic Haze, and solar radiation - among 200+ atmospheric measurements conducted at the facility. The Observatory supports more than a dozen cooperative research projects.
- **International Arctic Laboratory for Observing the Atmosphere**
- **National Environmental Satellite, Data, and Information Service (NESDIS)** polar-orbiting satellite downlink antennas
- **Climate Reference Network (CRN)** station

The large Barrow Atmospheric Baseline Observatory site also hosts several other US research facilities that were toured by the group.

- The **Atmospheric Radiation Measurement (ARM) Climate Research Facility** is a multi-laboratory, U. S. Department of Energy (DOE) scientific user facility, and a key contributor to national and international climate research efforts. ARM data are currently collected from three atmospheric observatories—Southern Great Plains, North Slope of Alaska, and Eastern North Atlantic. Nine DOE national laboratories share the responsibility of managing and operating the ARM Facility. The release of a data-gathering balloon was observed.

FAIRBANKS, ALASKA

- **Toolik Station** is a center and staging area for US scientific research in Alaska. (cancelled due to weather, but a briefing with the scientists there was set up for the members and their staff in DC two weeks later).

THULE AIR BASE, GREENLAND

Thule Air Base is located on the coast of northwestern Greenland and home to the 21st Space Wing, 821st Air Base Group, and 12th Space Warning System. While at the base, CODEL members toured and learned about the following:

- **Hangar 4**, location of a former Air Force fuel analysis lab that has been converted to an NSF-leased multi-purpose laboratory that supports US scientists and their research projects in Greenland.
- Hangar 6 where assembly of the **Smithsonian Astrophysical Observatory 12-Meter Radio Telescope** was underway. The \$10 M telescope was funded by NSF through its MREFC account as part of the development of the ALMA project and was awarded to the Smithsonian via a competitive process.
- **South Mountain**, site of the NSF-supported Thule High Arctic Atmospheric Observatory.

KANGERLUSSUAQ, GREENLAND

Kangerlussuaq's airport is a key jumping off point for many US scientific research undertakings, including NSF's Summit Station, the National Aeronautics and Space Administration's (NASA) Operation Ice Bridge, and research projects carried out on and around the nearby Russell Glacier.

- **NASA's Operation Ice Bridge** responds to the loss of a key NASA polar observation satellite. In 2009, ICESat unexpectedly stopped collecting and reporting data. ICESat's mission was to measure ice sheet mass balance, glacier and sea ice changes, cloud and aerosol heights, and land topography and vegetation over Greenland and Antarctica. With ICESat's successor, ICESat II, not due to be launched until 2018, a significant gap in US polar data collection was threatened. In response, NASA undertook a replacement program of specially equipped airplane flights that can collect three-dimensional data and "bridge" the gap between ICESat and ICESat II.

SUMMIT STATION, GREENLAND

Summit Station is an NSF-operated research platform at the summit of the Greenland Ice Sheet (GrIS). The GrIS is a vast body of ice covering 660,000 square miles, roughly 80% of the surface of Greenland. It is the second largest ice body in the world, after the Antarctic ice sheet. The ice sheet is almost 1,500 miles long from north-to-south and its greatest width is 680 miles. Ice thickness is generally more than 1.2 miles and nearly 2 miles at its thickest point. Isolated Greenland glaciers and small ice caps cover between 29,000 and 39,000 additional square miles. Sites visited at Summit Station include:

- **Big House**, the camp's primary building, with kitchen, dining area, and office spaces, and which houses a bathroom and laundry facility.
- **The Shop**, a generator shelter that also is used for maintenance of rolling stock.
- **The new Mobile Garage**, a structure built on a sled-base so that it can be moved around to avoid being buried by snow drifting from storms.
- **The Mobile Science Facility**, a laboratory that hosts year-round monitoring of lower atmospheric processes.
- **GISP-II borehole**, a 10,000 feet deep ice core hole that reached bedrock, providing records of past climatic conditions some 105,000 years back in time and information on historical events such as volcanic eruptions.

The group was also briefed on the following facilities:

- **Greenland Environmental Observatory**, which provides year-round monitoring of key climate variables to study air-snow interactions. The group

did not travel all the way to the Observatory, due to its distance from the main station and that no motorized vehicles can go there.

- **Green House/Berthing Module**, a joint science laboratory and berthing facility with lab and office facilities.