Radionuclides and Contaminants in Arctic and Subarctic Regions

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http://www.ims.uaf.edu/orion

Abstract

Alaska shares a common global atmosphere and ocean. Alaska Natives who are dependent upon subsistence foods are now concerned that their food may contain contaminants, such as radionuclides, as a result of past nuclear testing and nuclear waste. ORION (Observing Radiation In Our North) was initiated by the U.S. Department of Energy to monitor radioactivity in the atmosphere at several locations in Alaska. ORION also provides Alaska Native college students an opportunity to engage in environmental monitoring and public outreach.

Wily Splain helps install an ORION station in Barrow.

ORION

ORION, formerly known as Neighborhood Environmental Watch Network (NEWNET), is a network of stations that gather both meteorological and radiological data. ORION stations gather real time data and would detect any increase in background radiation levels should an accident occur. As the ORION stations are updated, they will located in Kotzebue, Nome, Barrow, and Fairbanks. There are plans to put one in Anchorage and another location in Southeast Alaska.

Richard David, Jenny Nakai, Loda Griffeth, Margaret Cysewski in the lab.

AISES

The American Indian Science & Engineering Society is a private, non-profit organization which nurtures building of community by bridging science and technology with traditional Native values. Through its educational programs, AISES provides opportunities for Alaska Natives and American Indians to pursue studies in science, engineering, technology and other academic areas. These graduates will be able to assume roles in which Native leaders manage and develop their lands and resources. The URL for the AISES website is http://www.aises.org. The URL for the UAF chapter of AISES is http://www.uaf.edu/aises. The ORION program is an official AISES project.

AISES students gather outside the UAF Museum next to ORION tower after installation.

Reasons ORION was Started

Long-term meteorological and radiological observations will provide a baseline against which any major changes in atmospheric conditions and radioactivity can be detected.

The former Soviet Union's nuclear plant at Bilibino, which is close to Alaska (2173 km), was a concern regarding radiation fallout in case of a nuclear accident. The atmospheric trajectory models for the period 1991-1995 suggested transport pathways probabilities [1]:

City	Probability	Average Time	Shortest Time
Anchorage	2%-7%	5.9 days	2.5 days
Nome	7%-18%	4.7 days	1.5 days
Barrow	11%-22%	5.1 days	1 day

Atmospheric transport from Europe and the Kola nuclear plant is possible, but with low probability and low concentrations there is no apparent serious threat [2].

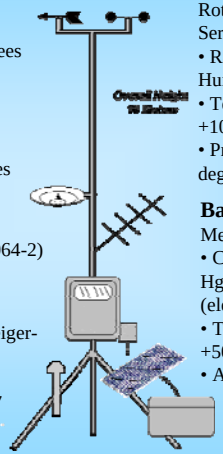
Lichens and other tundra or boreal plants could absorb significant amounts of radionuclide fallout in an event of a nuclear accident. This is a concern for the indigenous residents who practice a subsistence lifestyle.

Updated Monitoring Tower

Wind Sensors: Met One Wind Finder System
- Anemometer cup (Model 6266)
  - Range 0-100 mph
  - Temperature Range: -50 to +85 degrees Celsius
  - Precision: +/- 0.25 mph or 1.5%
- Wind vane (Model 037)
  - Range: 0-360 degrees
  - Temperature Range: -50 to 70 degrees Celsius
  - Precision: +/- 8 degrees

Air Temperature: Met One (Model 064-2) with solar shield
- Range: -50 to +50 degrees Celsius

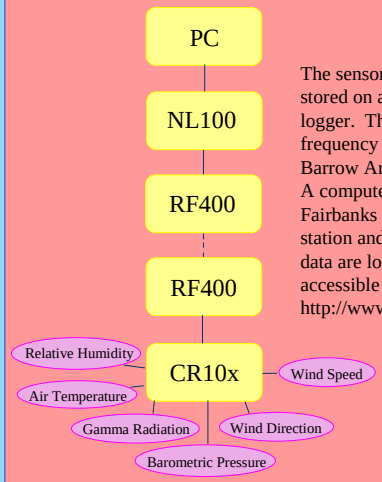
Gamma Radiation: RADOS Dual Geiger-Mueller Detector (Model RD-02L)
- Range: 0.01 microSv/h to 10 Sv/h
- Calibration Accuracy: +/- 5% of Cs 137 exposure @+20 degrees Celsius
- Temperature Range: -40 to 70 degrees Celsius



Relative Humidity: Rotronic Hygromer (Model Series 200)
- Range: 0 to 100% Relative Humidity
- Temperature Range: -20 to +100 degrees Celsius
- Precision: +/- 2% at 68-77 degrees Fahrenheit

Barometric Pressure: Met One (Model 090D)
- Calibration Range: 26-32" Hg at 0-1500 feet (elevation)
- Temperature Range: -22 to +50 degrees Celsius
- Accuracy: +/- 7%

All sensors were recycled from the previous stations except for the new gamma radiation detector.



Data Collection

The sensor data are collected, processed, and stored on a Campbell Scientific CR10X data logger. The data are transmitted via radio frequency to a base station located at the Barrow Arctic Science Consortium (BASC). A computer at the University of Alaska Fairbanks is used to connect to the base station and download data from station. The data are loaded into a database that is accessible by the public via the internet at http://www.ims.uaf.edu/orion. While the sensors are not calibrated and the data is not checked for quality assurance, the information provided is still useful to the general public and scientific groups.

References:

[1] Mahura, Alexander Grigorievich. Atmospheric Transport Pathways to Alaska From Bilibino Nuclear Power Plant [MS Thesis]. University of Alaska Fairbanks, 87pp, May 1998.

[2] Jaffe, Daniel, Alexander Mahura, and Robert Andres. Atmospheric Transport Pathways to Alaska From Potential Radionuclide Sites in the Former Soviet Union. Joint project report, UAF-ADEC, Geophysical Institute, University of Alaska Fairbanks, 71pp, February 1997.

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http://www.aises.org

http://www.ims.uaf.edu/orion

Margaret Cysewski with Radioactivity Releases in the Environment.

Tutorials

ORION interns, with University of Alaska faculty assistance, are producing a series of tutorials on environmental radioactivity. These tutorials are based on Radioactivity Releases in the Environment: Impact and Assessment, include a history of radioactivity, basic concepts and definitions of radiation, nuclear power and weaponry, health and waste issues and methods of measurements. The power point tutorials are designed for public presentation.

Loda Griffeth collects lichen and soil samples along the Seward Highway.

Lichen Radionuclide Baseline Research

ORION interns worked on a variety of student research activities including a lichen radionuclide survey.

Photo taken April 2004, from left to right: Doug Dasher, Sathy Naidu, David Norton, Jenny Nakai, John Kelley, and Richard David.

Participants:

•School of Fisheries and Ocean Sciences, UAF Institute of Marine Science

•Rural Student Services, UAF

•Department of Electrical Engineering, UAF

•Alaska Department of Environmental Conservation

•Los Alamos National Laboratory

Sponsored By:

Battelle-Pacific Northwest National Laboratory, Richland Washington, Contract Number 9064

Acknowledgements:

•Sue McHenry

•This paper is presented in memory of Larry Sanders, Los Alamos National Laboratory