

UAF researchers garner \$6.5 million in NSF grants

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Four researchers at the University of Alaska Fairbanks recently were awarded more than \$6.5 million in funding from the National Science Foundation for projects studying diverse aspects of the Arctic circumpolar region.

Three of the four projects are part of UAF's collaborative International Polar Year research efforts. Following are the grants awarded and the lead scientists at UAF:

“IPY: Pan-arctic Studies of the Coupled Tropospheric, Stratospheric and Mesospheric Circulation”

Richard Collins--UAF Geophysical Institute

Grant amount: \$803,668

This project will create an international network of four Rayleigh lidars, laser radars, located in Andoya, Norway; Chatanika, Alaska; Eureka, Nunavut and Kangarlussuaq, Greenland. The network will provide a chain of high-resolution temperature measurements from the eastern to western Arctic. The lidar system use echoes from the sky to measure temperatures at different heights, similar to what a weather balloon does, but at much greater elevations. The lidar beams reach 25 to 50 miles high.

The study's goal is to better understand the structure of the stratospheric vortex, understand possible connections between weather in the stratosphere and at the ground and establish a benchmark of measurements for assessing long-term changes.

“The Dynamics of Change in Alaska's Boreal Forests: Resilience and Vulnerability in Response to Climate Warming”

Terry Chapin--UAF Institute of Arctic Biology

Grant amount: \$3.28 million

The boreal forest is the second most extensive terrestrial biome on Earth, occupying 10 percent of the planet's ice-free terrestrial surface, and is the coldest forested biome. Boreal organisms, which have adapted to extremely low temperatures, are particularly vulnerable to warming and other global changes.

Alaska's boreal forest is warming as rapidly as any place on Earth and provides an unprecedented opportunity to study how this ecosystem adjusts to change. Since 1987, scientists with the Bonanza Creek Long-Term Ecological Research program have been studying the long-term consequences of climate change and disturbances, such as fire and insects, on Alaska's boreal forest.

The \$3.28 million National Science Foundation grant will enable scientists to expand their study to identify factors that buffer boreal forest ecosystems from radical changes in structure and functioning (resilience) versus factors that might precipitate changes to alternative states (vulnerability). Researchers will also explore the societal consequences

of recent and projected changes in the services provided by local boreal forest ecosystems, such as subsistence resources, and global services, such as carbon sequestration.

“IPY: Collaborative Research on Carbon, Water and Energy Balance of the Arctic Landscape at Flagship Observatories and in a Pan-arctic Network”

Donie Bret-Harte--UAF Institute of Arctic Biology

Grant amount: \$1.94 million

The Arctic Observing Network, an International Polar Year project led by Marion Syndonia “Donie” Bret-Harte of the Institute of Arctic Biology, will coordinate intensive, standardized pan-Arctic observations of major climate drivers such as carbon, water and energy balance from research facilities in Alaska, Russia, Sweden, Greenland and Canada.

The \$1.94 million National Science Foundation grant will enable the interdisciplinary and multinational AON group to establish two landscape-level observatories, link the data from these and other polar observatories to form a circum-Arctic network and produce a comprehensive description of the state of the regional Arctic systems. The AON group will also develop models of terrestrial responses and feedbacks to climate change.

At each observatory, the goal is to understand how changes in the fluxes of carbon, energy, and water are linked to each other in time. Understanding the present Arctic environment and feedbacks to climate are vital to answering larger societal questions about global change and the critical role of the Arctic in global processes.

“IPY: Collaborative Research: A Prototype Network for Measuring Arctic Winter Precipitation and Snowcover (Snow-Net)”

Doug Kane--UAF Institute of Northern Engineering

Grant amount: \$537,565

As the climate changes, temperature and precipitation records can reveal the most about what to expect in the future. But it’s difficult to produce accurate and reliable records of arctic precipitation. For 8 to 10 months of the year, precipitation falls as a solid--"snow, hail, “diamond dust,” sleet, and rime--and monitoring solid precipitation is more difficult than monitoring rain. Also, snow accumulates and forms a long-lasting cover that affects the arctic system even more than the amount of precipitation falling.

This project will establish an international network to concurrently measure both snowfall and snow on the ground. The research team will work with scientists in Japan, Canada and Russia to monitor five arctic sites, all key locations in a pan-arctic monitoring network, collecting data on snow depth, snow water equivalent and other properties. This strategy will make it possible to check the quality of data by comparing data collected by sensors and other instruments. Finally, this methodology can be applied to historical records to better estimate past precipitation trends.