

IU sends innovative technology to Antarctica to speed polar research

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Some of the equipment used by the Polar Grid. Credit: Indiana University

Environmental scientists studying the world's shrinking polar ice sheets will soon get a substantial boost in computing power thanks to IU's Polar Grid Project.

Funded by a \$1.96 million grant from the National Science Foundation (NSF), Indiana University and Polar Grid partners Elizabeth City State University (ECSU) and the NSF's Center for Remote Sensing of Ice Sheets (CReSIS), headquartered at the University of Kansas, are poised

this week to deploy a collection of customized computational resources to Antarctica that will allow scientists -- both on site and remotely -- to more securely and efficiently process data during polar field expeditions.

"The news we've seen out of Greenland and Canada in recent weeks is alarming. Scientists say ice sheets in existence for thousands of years are deteriorating rapidly and breaking apart," said Polar Grid Project principal investigator Geoffrey Fox. Fox is director of the Community Grids Lab, part of Pervasive Technology Labs at Indiana University, and also chairs the IU Department of Informatics. "It is critical to provide polar scientists with access to advanced computing technology during field expeditions; it will help them work more efficiently as they strive to gain a better understanding of the problems facing our planet -- and will allow them to move more quickly toward finding solutions," Fox said.

Starting Sept. 26, the Polar Grid equipment will be flown by commercial carrier to Port Hueneme, Calif., to be received by the NSF's official cargo system. From there, the equipment will travel by cargo ship to New Zealand, where it will board a U.S. military plane bound for McMurdo Station, Antarctica. At McMurdo Station, the equipment will be unloaded and staged for a second military air lift to the Western Antarctic Ice Sheet Divide Camp, where it will be driven a distance of approximately 190 miles to its final destination, a research camp to be established on Thwaites Glacier.

After completing the long trek to Antarctica, the equipment will be used to support an extensive research expedition expected to begin in November and running through February 2009.

In the past, data collected during this type of expedition could not be evaluated or processed until scientists returned to their home labs at the close of an expedition. The Polar Grid Project will help scientists in

Antarctica speed the time between data collection and scientific discovery by allowing them to begin processing ice sheet data collected from sensors and aerial and surface radar while still in the field. This will allow the scientists to identify problems with data collection and adjust experiments as necessary, to ensure that each expedition yields the highest possible quality of data. The deployed equipment also provides ample data storage and backup to prevent loss and damage of irreplaceable data.

Equipment being sent from IU to Antarctica includes: computing clusters; servers; a storage array; laptops; satellite transceivers; and networking and testing equipment. In addition to the equipment being deployed in the field, the Polar Grid Project is also providing two high performance computing clusters -- one at IU and one at ECSU. These clusters, which will be integrated into the NSF's national network supercomputers called TeraGrid, will be used to perform in-depth analysis on data collected during field expeditions.

All Polar Grid equipment bound for Antarctica will be shipped and protected from harsh polar elements in commercially available Pelican cases and specially designed "ruggedized" cases developed by IU.

"One of the biggest challenges was determining how to keep very sophisticated computing equipment safe and functional in harsh weather conditions," said Matt Link, director of Systems for University Information Technology Services' Research Technologies division. Link manages the IU team that assembled the Polar Grid equipment. "We had to work directly with manufacturers to design cases that will stand up to extreme cold, winds, snow -- all that Antarctica has to offer," he said.

Link was part of a team of IU and ECSU technologists that traveled to Greenland over the summer to deploy Polar Grid equipment for use in two smaller-scale field expeditions that concluded in August 2008. The

Greenland equipment was used to process data collected by aerial radar mounted on an airplane. The plane made four-hour data collection flights twice daily for the length of the expedition, yielding a staggering 12,000 gigabytes of data on the ice sheets and the bedrock below.

Polar Grid equipment was used by the CReSIS field team to generate images of the ice and bedrock that were sent back to Kansas for further examination by CReSIS engineers and scientists. Based on the results they processed in the field, scientists were able to make adjustments to the radar and sensors, in order to gather more data and more accurate data on areas of the ice sheet that showed the greatest change.

"The Greenland expedition gave us a great trial run," said Link. "It allowed us to get the equipment running smoothly in a real research environment before shipping out more equipment for the longer Antarctica expedition. Scientists using the Polar Grid equipment in Greenland made significant progress this summer, so we're very excited to see the difference this equipment will make for research teams heading to Antarctica."

Link described working in Greenland this summer as an unforgettable experience for him and the team of IU technologists.

"It's clear from recent news that the world has some big environmental challenges to overcome," said Link. "But scientists are working hard to help us understand and meet those challenges. It felt great to be right there on the front lines in Greenland, helping those scientists do their job. And to see the natural beauty of our Polar Regions first-hand -- it was just amazing."

For more information on the Polar Grid Project, view a seven minute video at [www.iuinfo.indiana.edu/bem/pro ... PolarGrid_Video.html](http://www.iuinfo.indiana.edu/bem/pro...PolarGrid_Video.html).

Source: Indiana University

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