New technology used to record Antarctic Ocean, ice temperatures

December 20 2011

A team of scientists, led by Scott Tyler of the University of Nevada, Reno, spent two weeks on the Ross Ice Shelf in Antarctica installing fiber-optic distributed temperature sensing equipment to conduct long-term monitoring of climate change effects on the ice pack and its potential for collapse. The equipment continually records temperatures for every meter of the ice shelf and to the ocean bottom 800 meters below the surface. Credit: Photo by Scott Tyler, University of Nevada, Reno.

Half-mile long thermometers have been dropped through the Ross Ice Shelf in Antarctica that will give the world relevant data on sea and ice temperatures for tracking climate change and its effect on the glacial ice surrounding the continent. The study based at the University of Nevada, Reno is funded by the National Science Foundation's Office of Polar Programs and other NSF grants.

"This technology is allowing us to do something never before done; to record continuous temperature data in and under the ice shelf," said Scott Tyler of the University of Nevada, Reno, who led the team of researchers at the desolate spot about 25 kilometers from the McMurdo Station research outpost. "The ice shelves serve as the 'corks' holding the large glaciers of west Antarctica from sliding into the ocean and raising sea level."

"The melting of the ice shelves from below by warmer ocean water represents a critical unknown in the assessment of Antarctic ice sheet collapse and the potential for very rapid sea level rise around the world. This will allow us to assess the potential for collapse," he explained.

Tyler, a professor in the University's College of Science, said the objectives of this first field season were to test the drilling design, test the fiber-optic installation and sensing and test the logistics of continuous monitoring and power system development for a full year of operation in the harsh Antarctic climate.

"The instruments are all ready for the winter now, with wind power, solar and camera set to record ocean temperatures through the seasons," he said. "We're already getting data downloads here at home eight times a day and the system is recording and sending temperatures and pressures perfectly. Our goals are to show that we can install these monitoring systems quickly and inexpensively, and then provide continuous data via satellite links throughout the long Antarctic winter."

The system continuously records temperature every meter along the cable, which is made from standard telecommunications fiber-optic cable surrounded by armoring to withstand the harsh pressures and conditions of the Antarctic Ocean. After drilling 200 meters through hard ice, the team lowered 800 meters of cable, reaching the ocean bottom where it also can measure the currents. A second hole through

the ice was drilled and the cable end was suspended about 50 meters below the ice shelf.

"We have fantastic data so far, showing a uniform ocean temperature at the freezing point of sea water, with warm water likely to appear at the ice-ocean interface in a month or so," he said. "Amazing temperatures, from a cold of minus 22 C near the ice shelf surface (the annual average air temperature in the region), an exponential increase to the ocean at minus 1.9 C and then in the ocean a constant minus 1.9 C. We expect to see about a 1.5-meter loss in ice thickness over the summer."

In addition to the data dumps throughout the day, the system will send photos of the installation from a stationary camera mounted on a tower at the unmanned site. The camera will allow them to see if the equipment withstands the harsh weather at Windless Bight, so named by early explorers Shackleton and Scott for the occasional periods of calm in an otherwise windy area.

The site is on the McMurdo Ice Shelf, a subsidiary of the Ross Ice Shelf. It was chosen to provide realistic ice sheet thickness and sufficient ocean depth and ease of logistics to adequately test power supply viability and data communications.

More information: For more information about distributed temperature sensing and its worldwide use to monitor the earth's temperature, visit www.ctemps.org or tiny.cc/j3fyr .

Provided by University of Nevada, Reno

https://phys.org/news/2011-12-technology-antarctic-ocean-ice-temperatures.html