CReSIS
Center for Remote Sensing of Ice Sheets
Nichols Hall
2335 Irving Hill Rd.
Lawrence, KS 66045-7612

Center for Remote Sensing of Ice Sheets

The Icebreaker

issue 1 | winter 2005

A Message from the Director

In the Spring of 2005 the National Science Foundation announced the selection of two universities as sites for Science and Technology Centers. The Center for Remote Sensing of Ice Sheets (CReSIS) at the University of Kansas was chosen from an original pool of over 150 competitors. It brings together scientists and engineers to develop technologies, conduct field investigations and improve models for understanding and predicting the role of ice sheets in sea level rise. I am honored by the opportunity to lead the Center.

The Center's strategic plan, science requirements, and other information are available on our website: www.cresis.ku.edu. As a part of our knowledge transfer program, we will produce a quarterly newsletter. I hope that you enjoy reading our first newsletter.

- Prasad Gogineni

Lonnie Thompson Awarded the 2005 Tyler Prize for Environmental Achievement

Lonnie G. Thompson, a Distinguished University Professor of geological sciences at The Ohio State University and senior research scientist with the Byrd Polar Research Center, is one of two scientists to win the 2005 Tyler Prize for Environmental Achievement. The Tyler Prize, administered by the University of Southern California, was established by the late John and Alice Tyler in 1973. It is the premier award for environmental science, energy, and medicine conferring great benefit upon mankind. Through their work, Tyler Laureates have focused worldwide attention on environmental problems.

Dr. Thompson's research has resulted in major revisions in the field of paleoclimatology, in particular, by demonstrating how tropical regions have undergone significant climate variability, countering an earlier view that higher latitudes dominate climate change. Thompson is one of the world's foremost authorities on paleoclimatology and glaciology. He has led more than 50 expeditions during the last 30 years, conducting ice-core drilling programs in the world's polar regions as well as in tropical and subtropical ice fields. Recently, Thompson and his team developed lightweight solar-powered drilling equipment for the acquisition of histories from ice fields in the high Andes of Peru and on Mount Kilimanjaro in Tanzania. The results of these histories, published in more that 180 articles, have contributed greatly toward the understanding of the Earth's past, present, and future climate system. Other Thompson-led expeditions have recovered a 460-meter-long ice core, the world's longest from a mountain range (Alaska, 2002); the first tropical ice core (Peru, 1983); and cores containing the entire sequence of the Last Glacial Stage as well as cores dating over 750,000 years in age, the oldest outside the polar regions (Tibet, 1992).

Thompson has received numerous honors and awards, including the Dr. A.H. Heineken Prize for Environmental Science, Royal Netherlands; Academy of Arts and Sciences; the Vega Medal of the Swedish Society for Anthropology and Geography; and the Commonwealth Award for Science and Invention (jointly with his spouse and collaborator, Dr. Ellen Mosley-Thompson). In addition to being awarded the Tyler Prize in 2005, Thompson

continued on page 2

2005 Talks and Events

Conferences Held
--Oct. 26-28, 2005: Goldthwait Symposium sponsored by the Byrd Polar Research Center at The Ohio State University. Theme: Our Polar Past and Present: History and Science Moving Forward From the 20th Century. Terry Hughes was awarded the Goldthwait Polar Medal.

Conferences Attended
--Sept. 28 – Oct. 1, 2005: Linda Hayden (ECSU), Malcolm LeCompte (ECSU), Lloyd Mitchell (ECSU), Jerome Mitchell (ECSU), and John Paden (KU), Twelfth Annual West Antarctic Ice Sheet initiative (WAIS) Workshop, Sterling, VA

Posters
--Timothy Rink (KU), "Plane wave radar", Board of regents meeting, Sept. 2005
--John Paden (KU), "Wideband Radars for Imaging the Bed and Mapping Internal Layers", Twelfth Annual West Antarctic Ice Sheet initiative (WAIS) Workshop, Sterling, VA, Sept. 28, 2005

Talks
--8/30/05: David Braaten, "Global Climate Change", KU Self Graduate Fellows lunch
--9/4/05: Lonnie Thompson, *60 Minutes*, "Meltdown," field interview on the Athabasca Glacier in Canada
--9/17/05: Carol Bowen & John Kostelnick, "Fall 2005 GIS Activities at Haskell", Haskell Indian Nations Univ.
--Sept. 22-23, 2005: Lonnie Thompson, "Abrupt Climate Change: Past and Present," Georgia Institute of Technology, School of Earth Sciences, Atlanta, GA
--9/29/05: Lonnie Thompson, "Abrupt Climate Change and the Human Response," Rotary Club of Circleville, OH
--9/29/05: David Braaten, discussion with Steve Kraske from the Kansas Public Radio studio. www.kucr.org
--9/29/05: David Braaten, "Polar Ice Research" Kansas City Chapter, American Meteorological Society
--10/4/05: Ken Jezek, "Satellite Observations of Antarctica: The RAMP and GISMO Projects Geophysical Institute", University of Alaska Fairbanks
--October 6-7, 2005: Lonnie Thompson, "Abrupt Climate change in the Earth System: Past, Present and Future," Geological Sciences, Virginia Polytechnic Institute and State University, Blacksburg, VA
--10/18/05: Lonnie Thompson, "Rapid Climate Change in the Earth System: Past, Present and Future," The Harold McMaster Visiting Scientist, Bowling Green State University, Bowling Green, OH
--October 19-22, 2005: Lonnie Thompson, "Abrupt Tropical Climate Change: Past and Present" and "Abrupt Climate Change: Hurricanes and Ice Cores: Toward the Development of a Long-term Hurricane Perspective" (with Y.C. Fang and D. Urmann) and "Ice Archives of Abrupt Environmental Change" (with Sangsuk Lee), Gary Comer Abrupt Climate Change Fellowship Meetings, IBM Palisades Conference Center, New York, NY
--10/20/05: David Braaten, "KU Research in Polar Regions", Guest Speaker at KU GEOL 171 Course (Earthquakes and Natural Disasters)
--10/22/05: David Braaten, "CReSIS", Geography Department Alumni Reunion at KU
--10/25/05: David Braaten, "Airborne radar measurements over Greenland in 2005 and signal processing accomplishments", NASA Ice Sheets meeting, Baltimore, MD
--10/26/05: David Braaten, "CReSIS", NASA Ice Sheets meeting Baltimore, MD
--10/27/05: Ken Jezek, "The Future of Cryospheric Science", Byrd Polar Research Center Colloquy, The Ohio State University
--10/28/05: Terry Hughes, "Oceans Head for Land When an Ice Sheet Becomes and Ice Shelf", Goldthwait Polar Medal Lecture, Byrd Polar Research Center Colloquy, The Ohio State University
--10/29/05: Arvin Agah, "Weekend of Engineering", University of Kansas Recruitment
--11/4/05: Lonnie Thompson, "Abrupt Climate Change in the Earth System: Past, Present and Future," The Ohio State University Byrd Polar Research Center seminar series, Columbus, OH
--11/7/05: Lonnie Thompson, "Abrupt Climate Change: Past and Present," The Inaugural Geoffrey O. Seltzer Lecture, College of Arts and Sciences, Syracuse University, NY
--11/14/05: Lonnie Thompson, "Glaciological Evidence of Abrupt Climate Change: Past and Present," Department of Physics, University of Toronto, Canada
--11/16/05: Lonnie Thompson, "Abrupt Tropical Climate Change: Past and Present," March of Dimes 2005 Awards Ceremony Keynote Speaker, Greek Orthodox Church, Columbus, OH

was elected to the National Academy of Sciences. He has been selected by *Time* magazine and CNN as one of "America's Best" in science and medicine, and *Rolling Stone* magazine recently selected him as one of twenty-five "warriors & heroes" tackling global climate issues. His research has been featured in hundreds of publications, including *National Geographic* and the *National Geographic Adventure* magazines.

Off to Antarctica

Preparing to visit and work in Antarctica is no small task. On December 1st, 2005, the first team (of 5 researchers) departed from KU for its 3 week stay, and on December 18th a second team of six from KU and ECSU will go to relieve most of them. The CReSIS researchers will be in Antarctica during December and January, which are the warmest months of the year,. The field season in Antarctica is short, limited to the austral spring and part of the austrial summer (October – January). The team will be working at a new field camp in West Antarctica called Inland WAIS (West Antarctic Ice Sheet). The elevation of Inland WAIS is about 1800 m, and the age of the ice at the bed is about 40,000 years old.

The proper clothes are important, and our team members have been issued a complete set of cold weather clothing in New Zealand. This clothing consists of several thin warm layers, topped with heavy coats, and team members will be particularly attentive to protecting all their extremities from the dread frostbite. Wrap-around goggles, to protect from ultra-violet radiation, are also a necessary precaution. Accomodations at Inland WAIS will be small unheated tents, with a common building for cooking and eating.

The team will operate radars onboard a rover or pulled by a snowmobile, make direct measurements of snow characteristics, and communicate their experiences to classrooms in the United States using an Iriduim Satellite-based communications system. The radar measurements will provide a detailed 3-dimensional picture of the ice sheet over approximately a 500 square kilometer area, and will provide valuable information toward interpretation of a deep ice core to be extracted from this site during the next 4 years.

-Emily Redell and David Braaten

Sources: Torry Akins and www.coolantarctica.com.

Active Source Seismology

At CReSIS' first All-Hands Video Conference, held in late November, Dr. Sridhar Anandakrishnan from Penn State was our faculty presenter.

- Active Source Seismology consists of making a sound and listening for an echo. The characteristics of the echo help determine the properties of the basal surface.
- Glaciologists use this method to attempt to discern what is below the ice.
- By recording when the echo returns, how strong the sound is, and what the shear-wave velocity profile is, glaciologists are clued into ice depth, thickness of its layers, and whether its base is made of rock, or water saturated, or even just water.
- For fast flowing glaciers, like Jachobshavn and Thwaites, determining the base of the structure is extremely important.

CReSIS
Center for Remote Sensing of Ice Sheets

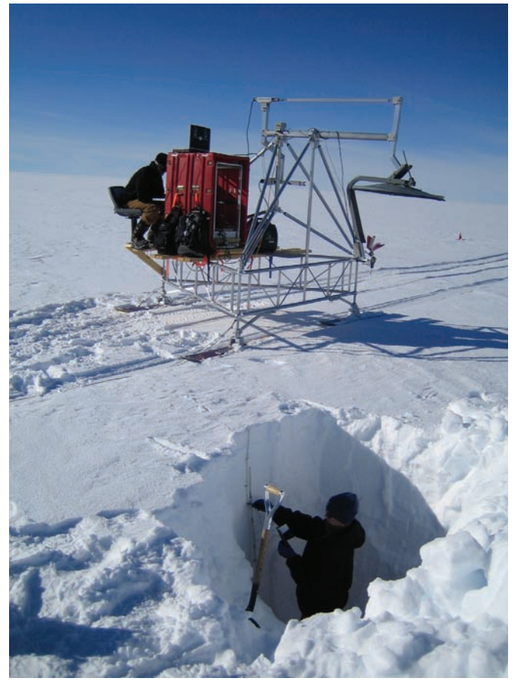
Using a Fine-Resolution Radar to Map Near-Surface Snow Layers

Current methods of gathering spatial and temporal information on snow accumulation by analyzing ice cores and snow pit stratigraphy are time consuming and prone to errors due to the sparse sampling. A radar with fine resolutoin of about 3 cm developed at the Center for Remote Sensing of Ice Sheets (CReSIS) by researchers at the University of Kansas is providing information on near-surface snow layers. In July 2005 the radar system was tested on the Greenland ice sheet. The information collected while testing in Greenland will be useful for interpreting measurements taken by satellite altimeters.

The fine resolution realized by the radar is achieved by using a wide bandwidth and an antenna which spatially filters surface clutter. The radar operates as a frequency-modulated continuous-wave (FMCW) mode, with a transmit frequency range of 12 – 18 GHz. Utilizing the full 6 GHz of bandwidth produces a range resolution of approximately 3 cm. The fundamental operating principle of the radar is fairly straightforward. The frequency of the transmit signal is increased over time at a specific rate, and as the signal is reflected off layers in the snow, the return signal is compared to the instantaneous frequency being transmitted. The difference in frequency of the two signals is related to a layer depth. The antenna acts as a spatial clutter filter by receiving only signals which take the shortest path from the antenna to the layers and back. The antenna does not receive signals which take longer paths to a layer—signals that would contaminate signals arriving from deeper layers.

A large amount of data was collected during the Greenland field season. The radar was used to collect data from single spots with known stratigraphy, small areas with known accumulation rates and long tracks up to 4 km. Stratigraphy and density measurements taken from several collocated spots and are being used to directly validate radar measurements and to build electromagnetic models of the firn. Current analysis indicates a high correlation between layers detected by the radar and actual stratigraphy. Data obtained will also be used to quantify the spatial and temporal variability of snow accumulation on the ice sheet.

-Timothy Rink



Graduate student, Timothy Rink, operates radar to collect snow accumulation information as undergraduate student, Kirby Zimmerman, collects stratigraphy information from snow pit.

Rafe Pomerance, Chairman of the Climate Policy Center, Visits KU

On Thursday, October 20, 2005, Dole Fellow Karen McCarthy hosted "A Discussion of Global Warming and a Citizen's Capabilities on Fighting It" at the Dole Institute of Politics. The guest speaker was Rafe Pomerance, former Deputy Assistant Secretary of State for Environment and Development under the Clinton Administration, and an accomplished activist in the fight against global warming. The forum was a lecture and question and answer session about methodologies for alerting policymakers and press about scientific discovery. Mr. Pomerance has over twenty years of experience as an organizer and was instrumental in drafting the Kyoto Protocol of 1991.

The seminar was open to the public, and attended by a group of CReSIS researchers and staff. Professor David Braaten from CReSIS was asked to give a few words about the CReSIS research project. He spoke about the importance of inter-disciplinary research. Mr. Pomerance went on to speak candidly about the need for a relationship between researchers and politicians in order for the public and enviornmental health and safety to be maintained. Rafe called the evening "A great opportunity to share in this very important investigation."

-Emily Redell