The Icebreaker

WINTER 2011 ANTARCTICA FIELD SEASON FEATURES SEVERAL DEPLOYMENTS

// by Jennifer Salva and Shawn Schaller

The CReSIS winter 2011 Antarctica field season is already underway, and a total of three deployments will have initiated by the end of the year.

The winter field season will be highlighted by a NASA DC-8 mission, an NSF Twin Otter mission, and an NSF Meridian UAV mission.

DC-8: NASA Operation IceBridge

CReSIS and NASA’s Operation IceBridge mission began on Oct. 10, 2011, and will continue through Nov. 22, 2011. The mission features the NASA DC-8 aircraft, which is equipped with three different radar systems: a Multichannel Coherent Radar Depth Sounder (MCoRDS), a Snow Radar and a Ku-band Radar Altimeter.

The deployment team arrived at the Dryden Flight Research Center in Palmdale, Calif., where they performed test flights and radar installations on the fourth and fifth of October before heading to Punta Arenas, Chile.

All flights during the deployment, which will consist of 210 total science flight hours, will begin and end in Punta Arenas. The deployment team will spend anywhere from 10-12 hours at a time in the air before returning to Punta Arenas. Utilizing alternating flight teams will allow a CReSIS instrument team to be in the air seven days a week.

The mission’s field lead, CReSIS Assistant Research Professor John Paden, is not only excited at the opportunity to fly over Antarctica for the first time, but also to fly an improved Snow Radar over the ice.

“This [Snow Radar] has a wider bandwidth, so that means better range resolution,” Paden said, explaining the recent modifications made to the Snow Radar. “So that’s going to be neat to look at those results, especially on sea ice where it’s used to measure snow thickness over sea ice.”

The MCoRDS will also be the subject of some changes, Paden said. The deployment team will experiment with different measurement setups of the MCoRDS system on the DC-8 aircraft.

Among those accompanying Paden on the deployment is CReSIS Graduate Research Assistant (GRA) Shashanka Jagarlapudi. For Jagarlapudi, this trip is particularly special because it is his first CReSIS deployment.

“Excited, nervous, and I’m actually taking two courses this semester,” Jagarlapudi said when asked how he was feeling about the deployment. “So I’m just nervous at how well things are going to balance out.”

Jagarlapudi, who will be processing data from Punta Arenas, is familiar with the

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duties he’s being asked to perform and the rigors of travel to new places. Both, he said, help ease some of the nerves that he might otherwise feel.

CReSIS’ NASA OIB team is expected to return the Tuesday before Thanksgiving, hopefully allowing them enough time to rest up and enjoy the holiday.

**Twin Otter: NSF**

NSF Twin Otter Deployment team leader Fernando Rodriguez-Morales will guide his team in the deployment to Antarctica during the winter 2011 field season.

The team is comprised of CReSIS Research Professor Rodriguez-Morales, Justin Miller of Indiana University, Assistant Research Professor Jilu Li, and two Graduate Research Assistants: Reid Crowe and Daniel Garcia-Gomez. They depart on November 10th, arriving at McMurdo Station in Antarctica on Nov. 14, 2011, and will return Jan. 13, 2012. Although this is Rodriguez-Morales’ sixth trip to Antarctica, the rest of the team is not that experienced.

The group will be flying aerial radar surveys over Byrd Glacier using CReSIS radars installed on a Twin Otter aircraft. Team lead Rodriguez-Morales will “operate the radar personally, especially during the test flights to ensure that everything is functioning properly.” He explains that “once the system is in a state where it doesn’t need much tweaking, then [he] can assign others to do the operation during the flight.”

Rodriguez-Morales stays involved in each flight and ensures that one of the 12 operating spaces is reserved for him.

The Indiana University Polar Grid Project will also be a part of this mission. This group is responsible for providing the NSF Twin Otter team with the computing equipment needed to process and backup the large amount of data collected via radar.

During the deployment, a separate UAV (Uninhabited Aerial Vehicle) mission will be conducted. These experiments will assess ice thickness and the surface elevation profile of Byrd Glacier. There will be an additional experiment on the ice shelf to measure melt rates.

As the date of departure approaches, Rodriguez-Morales looks forward to getting out in the field, where he will, as always, aim to acquire high-quality data to benefit the scientific community.

**Meridian UAV: NSF**

The Meridian UAV is set to make test runs out of McMurdo Station, Antarctica, during the winter 2011 Antarctica field season. The UAV team will depart from the U.S. on Dec. 3, 2011, and arrive at McMurdo Station from Dec. 7, 2011, where they’ll remain until Jan. 13, 2012.

The flight tests will include testing the use of CReSIS radars on the UAV. The radar to be used is a version of the MCoRDS modified to fit on the belly of the small aircraft.

The UAV team will depart from Kansas City International Airport on Dec. 3, 2011, and arrive in Christchurch, New Zealand on Dec. 5, 2011. In Christchurch, they will test out the field equipment and run logistics checks. From there, the team will fly to Antarctica on Dec. 7, 2011, where they will remain ‘on the ice’ until Jan. 13, 2012.

The UAV itself is shipped in three pieces; the fuselage takes up the majority of a large crate and the wings are strapped to the sides of the crate. For flight testing purposes, the UAV team will also have a Yak shipped to Antarctica. The Yak, an R/C scale model aircraft of an actual Yak aircraft, is used for flight testing prior to flying the UAV.

CReSIS GRA Emily Arnold, the UAV pilot’s assistant for the duration of the mission, said she “jumped at the chance” to be a part of the Meridian UAV deployment and see her handiwork in action.

“When I first started at CReSIS, I worked in the lab building the Meridian, and now I’ve gone off and done my own things that aren’t Meridian,” Arnold said, recalling her initial experience with the UAV. “We’ve had several students graduate that were on the flight test team… and since I’ve been around so long,” Arnold continued with a chuckle, “Dr. Hale asked me if I would like to go.”

As the pilot’s assistant, Arnold will act as the mediator between the team members operating the ground station and the pilot handling the UAV’s complex controls. The team members operating the ground station, Arnold said, are constantly giving the pilot velocities, altitudes, pitch angles and other necessary measurements. Because the pilot’s hands are full, however, Arnold’s job is to keep the pilot informed, calm and collected.

Arnold is also set to enjoy the experience of witnessing a marvel of modern science at work, one that was realized right here at the University of Kansas.
This summer, CReSIS Graduate Research Assistants (GRAs) Emily Arnold and Teresa Stumpf took the opportunity to advance their studies of remote sensing and Synthetic Aperture Radar (SAR) while absorbing the cultural benefits of traveling abroad. Upon returning, both Stumpf and Arnold submitted papers to CReSIS highlighting their summer experience.

Arnold began her summer excursions at Durham University, located in Durham, United Kingdom, in early July. There she attended the UAV Workshop, a two-day conference sponsored by the NERC (Natural Environment Research Council) Earth Observation Technology Cluster Program and the RSPSoc (Remote Sensing and Photogrammetry Society) UAV Special Interest Group.

The workshop aimed to generate further interest in sensor development, as well as increase knowledge of UAVs (Uninhabited Aerial Vehicles) and their applications. In her paper, Arnold recalls that many lecture topics discussed challenges that arise with the use of UAVs.

Several researchers explained their difficulties with appropriate UAV size and the effects of vibration on their cameras, which reminded Arnold of the benefits of a multidisciplinary center such as CReSIS. “We have experts in every aspect of what we do,” Arnold said in her paper, “and therefore can avoid missteps that many of our colleagues are making.”

While much of the workshop was geared towards the utilization of UAVs in the study of vegetation, lecturers also discussed monitoring ground traffic behavior and measuring boundary layer turbulence in Antarctic regions.

Following the RSPSoc and NERC Workshop, Arnold traveled to Rolandseck, Germany, for the Third International Summer School on Radar/Synthetic Aperture Radar (SAR), where she was joined by Stumpf. The Fraunhofer Institute for High Frequency Physics and Radar Techniques first organized the brief course into a series of lectures, then allowed students to apply the curriculum to one of three workshops.

Stumpf participated in the SAR workshop where she worked with her peers to construct a SAR simulator and processor that could produce an image from raw radar data. Arnold attended the antenna design workshop where she and her teammates designed an antenna array within certain boundary conditions and operational specifications. Her team successfully designed an antenna signal including every detail from the number of antenna elements to the length and number of pulses and sub pulses it transmitted. The third workshop option gave students the opportunity to work with bistatic radar sets, radar that transmits and receives radar waves from two separate antennas.

Stumpf related her experience to her work at CReSIS. “By attending lectures and applying concepts in the workshop, I was able to acquire a basic understanding of fundamental concepts on radar and SAR in a very short amount of time,” Stumpf said in her paper. “This understanding has inarguably benefited my current work at CReSIS, working with radar data.”

Both Arnold and Stumpf highly recommend that, if possible, their fellow CReSIS students attend the workshop next summer.
DR. KARLSSON VISITS CReSIS
// by Shawn Schaller

On Sept. 19, 2011, Dr. Nanna Karlsson, a post-doctoral researcher at the University of Copenhagen’s Centre for Ice and Climate, paid a visit to CReSIS headquarters in Lawrence, Kan., to present a lecture on “Retrieving basal conditions from Central and North East Greenland using radar data.”

Karlsson’s primary research interests lie in using ice-flow models and radar data to study past and present ice-flow dynamics. As a Ph.D. student, she worked with radar data from Pine Island Glacier in West Antarctica and was even involved with the interpretation of data taken from Mars’ North Pole. She is currently studying the conditions underneath the Greenland ice sheet.

During her CReSIS lecture, Karlsson presented a map of possible water-flow routes underneath the Greenland ice sheet and showed how those routes can be altered by gravity and mass-balance in less than 100 years. These studies hold a special significance for the Center because CReSIS data collected in Greenland show melting areas at the ice sheet’s base.

“If we are to better understand the dynamics of the Greenland ice sheet,” Karlsson said on the importance of the topic, “added insights into this water-drainage system might prove crucial.”

The Center and its members would like to thank Dr. Karlsson for her time and acumen on the Greenland ice sheet and wish her continued success in her future research endeavors.

CReSIS HOSTS STC DIRECTORS MEETING

// by Shawn Schaller

On Tuesday, Sept. 13, and Wednesday, Sept. 14, the Center for Remote Sensing of Ice Sheets hosted the 2011 STC Directors Meeting in Lawrence, Kansas. Directors from each of the 17 National Science Foundation (NSF) Science and Technology Centers (STC) arrived at the Oread Hotel on Monday night and spent the following two days participating in round table discussions and giving presentations.

The annual STC Directors Meeting gives the more specific areas of the centers (Education and Diversity, Knowledge Transfer, Administration, and Students), as well as the directors themselves, the opportunity to collaborate and explore ideas for growth and improvement.

After a welcome message by CReSIS Director Dr. Prasad Gogineni, participants spent the majority of Tuesday in sessions concerning education, diversity, administration, and knowledge transfer. Wednesday was comprised of presentations by the STC class of 2010 in the morning followed by closed-door sessions with representatives from the NSF in the afternoon.

It was an eventful two days for the CReSIS employees charged with organizing the meeting, but the event’s success and positive feedback make it all worthwhile.

“We received an excellent response,” CReSIS program assistant Jenna Collins said of the event’s success. “I feel that it was effective and productive for everyone involved.”
Introducing young children to topics as complex as glaciology and radars can be a tall task. In order to facilitate a strong connection between grade school students and this uncommon and complex subject matter, the CReSIS Education Team took their lessons to a platform that children are already familiar with.

In April 2011, Graduate Research Assistant Brandon Gillette and K-12 Education Outreach Coordinator Cheri Hamilton made plans to initiate brand new, interactive, and widely accessible online content that would directly reflect the lessons and activities they bring to the classroom. Two months later, Education Technology GRA Kuang-Chen Hsu came aboard and the project was officially underway.

“There are very few simple programs that teach glaciology,” Hamilton said of the inspiration behind the new project. “This is a very easy way to learn about glaciers.”

However, it was only after project development began that Gillette and Hamilton realized the full potential of the new interactive, online content. As products unfolded, expectations evolved.

“We’re really trying to reach a broader audience,” Gillette said of the projects overall goals. Both he and Hamilton believe the new e-content will act as a quality resource for teachers and a new way for parents to see what the CReSIS K-12 program brings to the classroom.

Naturally, the primary goal is still to produce a more interesting and efficient way to reach children with CReSIS-related lessons. While classroom visits will always be exciting for children and the CReSIS education team alike, the activities presented are limited to demonstrating a single lesson in a linear format. The new online content provides users with realistic visualizations, and its interactive nature allows the users’ choices and clicks to result in different outcomes on the screen.

The end product is a multi-dimensional, well-rounded glaciology lesson supplement and teaching tool.

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“With this animation, what they can do is take the [classroom] lesson into a real world context,” Gillette said. “An activity doesn’t do anything unless you put it in context.”

The man developing this virtual world, Hsu, is equally optimistic about his work’s potential.

“Nowadays, children are more familiar with computers,” Hsu said, “so if we can incorporate these activities into their daily lives, it will help them learn more and learn more easily.”

Relating CReSIS subject matter to anyone, especially to children, will always be a tall task. Ideally, playing to the strengths of our virtual world will make the education team’s latest project a success both inside and outside of the classroom.
A few new faces will be riding along the CReSIS radar sled this winter.

NASA’s Dr. Lora Koenig, Dr. Ludovic Brucker of the Goddard Space Flight Center, and Ph.D. candidate Clément Miège of the University of Utah visited CReSIS headquarters at the University of Kansas from Sept. 21 to Sept. 23, 2011. During their visit, the three familiarized themselves with one of the CReSIS radar sleds and two CReSIS radar systems: the Ku-band radar and the snow radar, both of which they will bring along on their upcoming traverse across Antarctica.

Beginning in late November, Koenig, Brucker, Miège and three others will undertake the Satellite Era Accumulation Traverse (SEAT). The group will spend approximately six weeks, from Nov. 21, 2011, to Jan. 7, 2012, traveling across West Antarctica with the CReSIS sled and radar equipment, collecting radar returns from different ice layers along the way. The team will also dig for ice cores to analyze the accumulation layers.

At first glance, the CReSIS radar sled appears to be a triangular, pyramid-shaped metal frame mounted on three snowboards. It holds two bistatic radar systems, each with two antennas mounted, facing down, on a horizontal bar that hangs out and away from the rest of the pyramid frame. Not built for comfort, the sled contains a single platform upon which a radar operator stands next to a red encasement housing the radar equipment. The sled is pulled across the snow by a snowmobile, which a second person operates. It is important to switch between operating the radar and driving the snowmobile during a radar surveying day to give the person operating the radar sans gloves a break. Checking the radar signals on the laptop is a difficult-to-impossible task while wearing big mitts, and there are days when the temperatures falls far below 0°C.

At the beginning of the mission, approximately one week will be spent in McMurdo Station, Antarctica to assemble the complex radar sled and prepare and test the radar equipment. From there, the team will fly to Byrd Station, located on the West Antarctic Ice Sheet (WAIS), on a C-130 and spend the entire month of December traversing the WAIS divide region before flying back to McMurdo Station at the end of December.

“Hopefully if the traverse is going well this year, we will spend New Year’s in McMurdo,” Miège said. The team is well aware that during this kind of expedition, the weather will play an important role and delays could arise. All that’s left to do is wish them good luck on this Antarctic expedition!
CReSIS graduate research assistant José Vélez Gonzales was recently awarded the NASA Harriett G. Jenkins Fellowship.

José Vélez Gonzales is a US Citizen and native of Puerto Rico. He has worked for CReSIS as a GRA since 2008 and is currently working toward his Ph.D. in Geophysics. He plans to use the fellowship in May 2012 to gather radar and seismic data, which he will then use to research ice column and ice bed properties at an as-yet undetermined location.

Brown-Simmons demonstrated how climate change information can be clearly represented through images, diagrams, and interactive models. She also spoke on her innovations in youth education through the GLOBE Program, which provides geo-education to young students and demonstrated how an interactive gaming environment can be used to reach and educate demographics of all ages.

According to Brown-Simmons’ academic profile, her aesthetic insight enhances image processing, animation, simulation and interactive immersive environments. The exquisite beauty of science is clearly reflected in Brown-Simmons’ artistic, yet factual depictions, and her passion for education was more than evident in her presentation.

Brown-Simmons’ work helps young minds merge science, technology and art in unique ways, hopefully inspiring them to seek further knowledge in STEM fields of education.
The September 2011 issue of IEEE Spectrum magazine featured a story on radars developed by CReSIS for sounding and imaging of ice sheets in Greenland and Antarctica. The paper, “A Next-Generation Ice Radar,” highlights the Center’s recent trip to Greenland in the P-3 aircraft and explains the fundamental ideas of using radars to monitor glaciers and ice sheets.

IEEE Spectrum is the primary publication of the Institute of Electrical and Electronics Engineers (IEEE), an association renowned as a world leader in advancing technology. This magazine is distributed to more than 385,000 professionals and executives in technology-centric sectors of the workforce worldwide (spectrum.ieee.org/static/aboutus).

“It’s really an honor to have the Center’s research chosen for publication by IEEE Spectrum,” Paden said of the publication. “I’m also very grateful to Dr. Gogineni for letting me take the lead on the original paper submission.”

Congratulations to Dr. Paden, Prof. Gogineni and Prof. Braaten for their publication and the opportunity to further promote Center research and the CReSIS cause.

Sam Buchanan joined CReSIS as an Undergraduate Research Assistant in October, 2011. He is currently a sophomore at the University of Kansas studying Electrical Engineering. At CReSIS, Buchanan will work with Signal Processing. While working at the Center, he hopes to gain experience by eventually coordinating and undertaking a large, individual project. In his spare time, he enjoys playing soccer and a board game called Goat.
Jay Fuller joined CReSIS as a Temporary Electronics Technician in September, 2011. He received his Bachelor’s Degree from the University of Kansas in Mechanical Engineering and is currently working toward his Master’s Degree in the same field. Fuller looks forward to being a part of the unique learning opportunity the Center presents. While at CReSIS, he hopes to expand his knowledge of electromagnetics. In his spare time, he enjoys playing video games, computer animations, and light programming.

Carson Gee joined CReSIS as the Senior Network Specialist in August, 2011. Gee received his Bachelor’s Degree in Computer Science from the University of Idaho. He previously worked for the University of Kansas School of Engineering’s Computing Services (Internet Engineering) and for the National Information Technology Center in Kansas City as a Senior Network Security Infrastructure Engineer. Gee was drawn to CReSIS because of the unique computing and storage needs of the Center and hopes to modernize the CReSIS data center for better service. In his free time, he enjoys snowboarding and playing the drums.

Dr. Matthew Hoffman joined CReSIS as a Postdoctoral Research Associate in August, 2011. He received his Ph.D. in Environmental Sciences and Resources with a concentration in Geology from Portland State University in August. Previously, he received two Bachelor’s degrees from the University of Illinois and his Master’s degree from the University of Wisconsin. At CReSIS, Hoffman will work with the Fluid Dynamics Group of the Climate, Ocean, and Sea Ice Modeling Project at Los Alamos National Laboratory. He hopes that his contributions at CReSIS will help improve sea level rise predictions from Antarctica and Greenland.

John King joined CReSIS as an Undergraduate Research Assistant in October, 2011. King is a junior at the University of Kansas in Geography Information and Analysis. He also participates in Environs and the Undergraduate Geography Club through the University. While at CReSIS, King hopes to get as much hands-on experience as possible while contributing to continued success of the Center’s cause.

Craig Lane joined CReSIS as a Student Assistant Administrator in October, 2011. Previously, he held the same position for Residential and Hospitality Services at Michigan State. He is currently an undergraduate sophomore at the University of Kansas. At CReSIS, Lane hopes to gain hands-on experience with handling servers, networking and programming. He also enjoys occasional programming on the side as well as video games and movies.
Darryl Monteau joined CReSIS as the Education Coordinator in October, 2011. Previously, she held the same position at the KU Medical Center in Kansas City and most recently worked for Data and Analytics under the Vice Provost of Student Success at the University of Kansas. Monteau came to CReSIS for the opportunity to work with students as part of an outreach program. She hopes that during her time here she can assist the Center with its mission to inspire students to pursue education in STEM fields. In her spare time, Monteau enjoys sewing, music and spending time with her family.

Jennifer Salva joined CReSIS in August, 2011. She is currently working towards Bachelor’s degrees in both Journalism and Film & Media Studies from the University of Kansas. In addition to participating in activities within the Journalism and Film departments, Jennifer enjoys competing on alto saxophone and is an active member of many Czech and Slovak organizations throughout Kansas and Missouri. During her time as a student journalist for CReSIS, Jennifer hopes to utilize her communication and writing skills to benefit CReSIS while developing her interpersonal skills towards a career in international relations.

Peng Seng "Isaac" Tan joined CReSIS as a Graduate Research Assistant in September, 2011. He is working toward a Doctorate in Electrical Engineering. Tan received his Bachelor’s Degree from the National University of Singapore and his two Master’s Degrees in Electrical Engineering from the Singapore Nanyang Technological University and the University of Kansas. Tan has previously worked for DSO National Laboratories in Singapore as a senior member of the technical staff and a project leader. While at CReSIS, he will initially be developing signal processing algorithms. Throughout his time here he hopes to immerse himself in the CReSIS culture and its goals and missions.

Ke Xu joined CReSIS as a student employee in August, 2011. Xu is working toward a Master’s Degree in Electrical Engineering; she earned a Master’s Degree in Mechanical Engineering from the University of North Texas. Previously, Xu worked as a research assistant for the American Iron and Steel Institute (AISI) and the Metal Building Manufacturers Association (MBMA). While at CReSIS, she hopes to familiarize herself with the entire CReSIS cause and all of its functions. In her spare time, Xu enjoys watching movies and traveling.

Steven Yan joined CReSIS as an Assistant Research Professor in October, 2011. Yan received his Bachelor’s degree from the University of Hong Kong, his Master’s degree from the Hong Kong University of Science and Technology, and is set to receive a Ph.D. in Electrical and Computer Engineering from the University of Illinois at Urbana-Champaign in December, 2011. At CReSIS, he will manage the construction and operation of an MRI Anechoic Chamber and assist with signal processing and radar development. He hopes his expertise and knowledge with antennae will be a useful asset to the CReSIS team in the continued improvement of antenna systems and radar designs.