# International Permafrost Association Country Reports

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## United States of America

Members of USPA assisted in review and final page production of several TICOP proceedings volumes and with the financial assistance of BP and Arctic Foundations Inc.

Dave Swanson, National Park Service, Fairbanks, Alaska, continued monitoring the growth of retrogressive thaw slumps across the Noatak National Preserve in northwestern Alaska by 3D stereo-photo analysis. The NPS now has three years of data at 18 slumps. Many slumps continued rapid growth by escarpment retreat of over 20 m between 2011 and 2012.
NPS physical scientists Pam Sousanes and Ken Hill completed installation of 15 climate monitoring stations distributed around the five National Parks in northwestern Alaska. In addition to atmospheric climate data, these stations collect soil temperatures year-round down to 50 cm depth. In addition, the USDA-NRCS SNOTEL station in the Noatak National Preserve has recently been upgraded with soil temperature sensors.

Figure 1: Aerial photograph of a retrogressive thaw slump on the Noatak River in the Noatak National Preserve, September, 2012. The escarpment of this slump retreated as much as 30 m between July 2011 and September 2012, releasing approximately 50,000 m3 of material as the slump grew to cover 3.5 ha

The University of Alaska Anchorage offers on-line Arctic Engineering courses, including Frozen Ground Engineering, to graduate level students around the world (http://www.uaa.alaska.edu/schoolofengineering/programs/arctic/) The courses are also listed in the University of the Arctic Catalogue and are available to all students in the member institutions. The ASTM International is publishing a *Selected Technical Papers (STP),* an online and printed publication on the papers submitted to the ASTM International Symposium on Mechanical Properties of Frozen Soil held in Jacksonville, Florida, Jan. 31, 2013. Contact the Symposium Chair at HKZUbeck@ uaa.alsaka.edu with questions.

**Adrian McCallum, University of the Sunshine Coast, Australia**, worked with the Australian Antarctic Division in identifying options for sustained use of a road over permanent ice at Australia's Casey Station, Antarctica. The road to the Station consists of gravel that is deposited seasonally over 2 to 3 m of perennial ice. However, ongoing maintenance of the road is unsustainable because local-sourcing of gravel will shortly not be possible. Therefore, implementation of a 'passive', thermally isolated road over the existing or similar road alignment was recommended; a design that preserves the integrity of the ice sub-grade through the use of insulation, isolates the erosive and warming effect of melt water, provides the means for retention and preservation of a gravel drainage layer, and allows for ongoing use by both wheeled and tracked vehicles. Adoption of well-established northern hemisphere practices in Antarctica can assist in the cost-effective development and sustainment of polar infrastructure.

Figure 2: Image shows excavation of site to verify stratigraphy suggested via GPR.

Permafrost microbial ecology, Lawrence Berkeley National Laboratory. Janet K. Jansson, Senior Staff Scientist and Ecosystems Biology Program Lead in the Earth Sciences Division, LBNL and co-workers have several ongoing projects focused on the impact of climate change on permafrost in the arctic. The projects include the DOE-funded Next Generation Ecosystem Experiment (NGEE) –Arctic, that is coordinated by Stan Wullschleger at Oak Ridge National Laboratory, with several DOE Lab and University participants. The Jansson lab has been working closely with several members of the NGEE consortium, including biogeochemists (David Graham, ORNL, Margaret Torn, LBNL), geophysicists (Susan Hubbard, LBNL) and climate modelers (William Riley, LBNL) to focus on the microbial community response to changing landscape features, such as polygon formations, near Barrow, Alaska. The DOE Joint Genome Institute (JGI) recently awarded NGEE with a Community Sequencing Project (CSP) to cover sequencing costs associated with NGEE. In addition, Jansson is collaborating with Mark Waldrop (USGS) to determine the impact of fire and natural thaw on permafrost communities in central Alaska. She also has several international research collaborations focused on permafrost microbiology.

Prof. Lise Øvreås, a visiting Fulbright Arctic Chair from Bergen, Norway is visiting the Jansson laboratory to study permafrost microbes in intact cores collected from Svalbard, Norway. Jansson is currently an Adjunct Professor in the recently launched Danish Center of Excellence for permafrost research (CENPERM). Carsten Jacobsen and other members of the CENPERM center are studying the impact of climate change on permafrost in Greenland. Jansson and her collaborators aim to compare data collected from the different arctic locations to determine geographic patterns in the microbial response to climate change.

Circumarctic Lake Observation Network. As part of NSF's Arctic Observation Network initiative, three teams began collecting data from lakes on the Alaskan North Slope in April 2012. The CALON winter group included Chris Arp, Guido Grosse, Ben Jones, and Ben Gaglioti working on an eastern transect of lake sites, as well as Ken Hinkel, Richard Beck, and Doug Whiteman working on a western transect, and John Lenters and Brittany Potter working on an intensively studied "focus lake" in Barrow. From each of the 56 lakes, lake ice thickness, snow depth, and water samples were collected for biogeochemical analysis. In each lake, a string of sensors were deployed to measure near-surface and lake bed temperature, as well as water depth. Meteorological stations were deployed at 9 nodal sites. In summer, the teams returned to service and redeploy the data loggers, collect sonar data to map lake bathymetry, install lake bed temperature sensors, and collect water samples for biogeochemical analysis by Karen Frey and Amy Townsend-Small. An additional CALON group (Wendy Eisner and Chris Cuomo) interviewed Inupiaq natives to document their observations on environmental changes to lakes, rivers, and the tundra. The group headed by John Lenters also deployed a comprehensive data buoy on the focus lake in Barrow to make detailed water and energy balance measurements. The CALON project had extensive outreach components and researchers gave talks to the local communities and schools in Barrow and Atqasuk. The project field data and remote sensing imagery is organized by Changjoo Kim and Hongxing Liu, and will be archived on the A-CADIS site.

Kenji Yoshikawa, Water and Environmental Research Center and the International Arctic Research Center, University of Alaska Fairbanks, established permafrost monitoring sites in 256 communities in Alaska as part of a permafrost outreach network that includes Little Diomede and St. Lawrence Islands, as well as 10 communities in Yukon, Canada, working with Laxton (Yukon Geological Survey), 23 educational departments in Russia with Khalilova (RAS) and 26 schools in Japan with Harada (Miyagi University). The results of these works will be published as a ground temperature resource book in spring 2013. The book will be delivered to the communities. As part of this outreach program, we have developed K–12 class lessons, including a video series called "TunnelMan" (final episode [episode 5] released in June 2012) to educate students about permafrost. Yoshikawa (UAF) plan to establish a permafrost outreach network in Arctic Canada during spring, 2013-2015, traveling 6000 km by snowmobile along the Northwest Passage and traveling inland as well, which should cover most northern communities in Canada. Yoshikawa, Bolton (UAF) and international science team visited Mt. Kilimanjaro, Tanzania, to retrieve data, take new measurements, and establish a satellite-based datalogger near the Northern Ice Field. This expedition was part of the GLOBE program that involved five teenage students including two students and two teachers from Alaska. All of the students successfully reached the summit, as in the 2009 and 2010 campaigns. Yoshikawa, INGEMET (Instituto Geologico Minero y Metalurgico) (Masías and Apaza), and the Universidad Complutense Madrid (Ubeda) team revisited the Peruvian Andes (Nevado Chachani and Colopuna) to drill, retrieve data, take new measurements, and establish a satellite-based datalogger near the south-facing slope of Nevado Colopuna at 5300 m.

Figure 3:Installations of satellite based communication datalogger at Peruvian Andes

Figure 4: Frost tube installation in Yakutsk school

Nikolay Shiklomanov of George Washington University (GWU) reports on the GWU/UD - CALM III activities in Alaska and Russia. The 2012 field team consisted of Dima Streletskiy (GWU), Anna Klene (University of Montana), Fritz Nelson (University of Delaware), two GWU students (K. Nyland, T. Swales) and Vasily Kokorev (State Hydrological Institute, St. Petersburg, Russia).

The GWU/UD team measured active-layer thickness and ground temperature at a series of CALM sites representative of the diverse climatic and landscape conditions on the North Slope of Alaska and the Seward Peninsula. Ground subsidence monitoring by means of differential GPS was conducted at several sites. Anna Klene and Kelsey Nyland conducted a series of interviews in Barrow as part of an ongoing project focusing on changes in the thermal regime in traditional Inupiat ice-cellars. The GWU CALM project also facilitated annual observations at 86 Russian sites. All data collected under the CALM project are available at CALM webpage at www.gwu.edu/~calm.

Numerous CALM related presentations were made at the AAG meeting in New York, IPY meeting in Montreal, and TICOP in Salekhard. Streletskiy organized a session titled “Russian permafrost regions: Past and current research activities” at AAG. Kelsey Nyland’s poster received the first place award in the Cryospheric Changes in Polar Regions session in Montreal. Dima Streletskiy was one of the teachers of the International Permafrost Class organized immediately after the TICOP. More than 30 students from six countries participated in the course. Students were introduced to permafrost and landscape research methods in natural and technogenically modified landscapes, including site evaluations, temperature and active-layer monitoring, methods of construction on permafrost, and related topics. Emphasis was placed on relationships between permafrost and other natural processes and environmental factors.

The U.S. National Science Foundation (NSF) funded a collaborative project between GWU and the University of New Hampshire titled “Interactions between air temperature, permafrost and hydrology in the high latitudes of Eurasia”. This three-year project is aimed at understanding how increases in air temperature can promote changes in the magnitude and timing of river flow and describe the physical processes driving these changes. An interdisciplinary Arctic research group was formed in the Institute for European, Russian, and Eurasian Studies within the GWU Elliot School of International affairs to facilitate research on the complex interactions between climatic, political, and economic drivers of changes in Russian permafrost-affected urban communities. This initiative was supported by the NSF funded five-year project “Building a research network for promoting Arctic urban sustainability in Russia”. The objective of this research coordination network is to advance a new research frontier by expanding understanding of Arctic urban sustainability in Russia.

Report compiled by Anna Liljedahl (akliljedahl@alaska.edu)