



## 2010 Member Activities

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The **2010 Fall Meeting of the American Geophysical Union** took place in San Francisco, California, December 13–17. Approximately 235 talks and posters dealt with frozen ground, presented across many AGU sections and focus groups. Presentations covered geochemical, geophysical, and geomorphic aspects of permafrost, remote sensing and modeling techniques, permafrost's relationship to the ecohydrology of Arctic and sub-Arctic ecosystems, climate feedbacks and interactions, environmental change, and many other topics.

The **USPA Annual Meeting** was also held on 15 December during the 2010 AGU Fall Meeting. Torre Jorgenson succeeded Jim Rooney as President. Margaret Cysewski was appointed as the new USPA-PYRN liaison, a position formerly held by Anna Liljedahl who was elected USPA secretary. Oliver Frauenfeld took over as president-elect, and Michael Lilly re-joined the Board of Directors as an at-large member.

The **2010 Annual Meeting of the Association of American Geographers** took place April 14–18 in Washington, D.C. The AAG's Cryosphere Specialty Group (CrSG) sponsored and co-sponsored 11 sessions. These included a session specifically on frozen ground and periglacial environments, as well as sessions on glaciers and changing environments, interactions between the cryosphere and atmospheric circulation, and hydroclimatology. The annual CrSG awards were presented and former USPA board member and president Ken Hinkel was recognized with the 2010 *Francois Emile Matthews Lifetime Achievement Award*. The *R. S. Tarr Illustrated Student Paper Award* went to Ms. Rachel Bernstein with her poster "Southern Ocean Sea Ice Volume Transport using NIC Chart-Derived Thickness Distributions."

2010 education and outreach activities between the USPA and the **Permafrost Young Researcher's Network (PYRN)** consisted of a travel grant competition for the Fall Meeting of the American Geophysical Union. Jessica Cable (University of Alaska Fairbanks), Sarah Godsey (Pennsylvania State University), and Louise Farquarson (University of Alaska Fairbanks) each received \$500 during the Annual USPA Meeting in San Francisco. Prior to the 2010 Fall AGU meeting, PYRN and the Association of Polar Early Career Scientists (APECS) held a one-day career development workshop on Sunday 12 December 2010. The workshop provided a great opportunity for young researchers working in the Polar Regions and the cryosphere to meet new colleagues and mentors, and develop skills not often taught during graduate education programs. Eight invited speakers represented NSF, NASA, various universities, and a Polar-TREK teacher.

The **2010 IARC summer school** entitled "*Arctic in a changing climate: Connection to permafrost*" built upon the successful field trip along the Dalton Highway offered during the 2008 Ninth International Conference on Permafrost. Of the nearly ninety applicants from across

the globe (41 from U.S.), 17 students were competitively selected to attend the two-week long intensive course lead by Ronald Daanen and Skip Walker at UAF. The event began with lectures given in Fairbanks by over 15 experts in permafrost sciences and other disciplines with ties to permafrost (engineering, biology, ecosystem modeling, disturbance, climate modeling, social sciences, and hydrology). The following week was spent along the Dalton highway and offered an in-depth view of the landscapes and research along one of the most remote and scenic highways in North America. All students were provided a full scholarship that covered travel and living expenses. The USPA co-sponsored the summer school with \$5500.

Jerry Brown reports that his early-career permafrost colleague, John B. O'Sullivan, died in December. They published papers on the geochemistry of permafrost in the early 1960s (see the *Proceedings of the First International Conference on Permafrost*). Brown also reports that during the Oslo International Polar Year conference, 12 U.S. reports were presented during the nine oral and one poster sessions under the theme "Permafrost on a Warming Planet." In May, the University of Alaska Fairbanks honored Brown by bestowing upon him an honorary Doctor of Science degree.

The **Geophysical Institute Permafrost Laboratory** research team (now 6 researchers, 1 research technician, several graduate students) in collaboration with Russian and Mongolian researchers continued the establishment of the observation borehole network for the thermal state of permafrost monitoring in Alaska, Russia, and Central Asia as part of the Arctic Observing Network project. The work included data collection and maintenance of existing boreholes, instrumentation of new or recovered boreholes, and gathering of historical data. Results of measurements have been submitted to the AON Cooperative Arctic Data and Information Service portal. S. Marchenko and V. Romanovsky, in collaboration with European scientists within the CARBO-North project, worked on quantifying the carbon budget in northeast European Russia across temporal and spatial scales by using permafrost dynamics modeling driven with HIRHAM5 at an unprecedented horizontal resolution of only 4 km. G. Grosse continued work within NASA Carbon Cycle Sciences and NSF ARC projects on thermokarst lake dynamics and related carbon cycling, including fieldwork on the Alaska North Slope and the Seward Peninsula. Both projects involve several students as well as collaborations with U.S., Russian, Canadian, British, and German researchers. A new project supported by the U.S. FWS was started to estimate probabilities of thermokarst lake drainage in a portion of the NPRA to support Fish and Wildlife habitat management tasks. R. Muskett continues permafrost research work funded by NASA, NSF, and State of Alaska. He continues applications of satellite geodetic methods for permafrost change detection and assessment over the northern hemisphere. During 2010 he organized and chaired permafrost sessions at the American Geophysical Union Fall Meeting 2010 in San Francisco, California, and the European Geosciences General Assembly 2010, Vienna, Austria. R. P. Daanen, although still associated with the GIPL, started working in early 2011 for the Water and Environmental Research Center in the Institute of Northern Engineering. He is currently working on a DOE funded project Arctic Transportation Network. The task as part of the project is to predict changes in soil temperature. New funding from the Alaska University Transportation Center will develop deeper understanding of groundwater interaction with highway embankments on permafrost.

Hannele Zubeck, a Professor and Chair of **Arctic Engineering Graduate Program at the University of Alaska Anchorage** (UAA), reports that students can now achieve a Master's of Science in Arctic Engineering from UAA entirely through distance education, most courses being online and some taught via Smart Classrooms. The program offers courses, imperative to engineers working in or for the Arctic, in Frozen Ground and Pavement Engineering, Arctic Hydrology and Hydraulic Engineering, Ice and Snow Engineering, and Arctic Utility Distribution. Courses are available to international students (contact Dr. Zubeck at [afhkhz@uaa.alaska.edu](mailto:afhkhz@uaa.alaska.edu) for more information). Ben Still, an Arctic Engineering graduate student, was awarded URS Fellowship for his Masters Studies and to research how to compliment visual classification of frozen soils with index tests. The aim is to revise ASTM International standard D4083. Hannele will chair an ASTM International Symposium on Mechanical Properties of Frozen Soils to be held in Jacksonville, Florida on January 31, 2013 with a web option. The objective of the symposium is to provide a forum for the exchange of ideas on current research on testing of mechanical properties of frozen ground. A further goal is to provide a rationale for the various details within a new standard for triaxial testing of frozen soils.



*Nenana High school students visiting Fox permafrost tunnel (photo: K. Yoshikawa).*

Kenji Yoshikawa (**Water and Environmental Research Center, University of Alaska**) has established 161 communities in the permafrost outreach network, now including almost all of the Alaskan permafrost-occupied communities and Little Diomedes, St. Lawrence Islands. All results will be published as a ground temperature resource book in 2011 and delivered to the communities. As part of this program, K-12 class lessons are developed for permafrost education including the series of *TunnelMan*. Yoshikawa revisited Mt. Kilimanjaro, Tanzania, to retrieve data and obtain new measurements. This expedition was part of the GLOBE program, which included teenage students (including

Alaskans and Native Americans) and Alaskan teachers. As in 2009, all of the participants successfully reached the summit. Two additional boreholes were drilled and instrumented with dataloggers at the summit crater, and data were retrieved from five boreholes including the summit (5800 m) glacier site. Permafrost is present 3 m below the ground surface near the summit, where the glacier has retreated. Yoshikawa and a group from the Universidad Complutense Madrid (including D. Palacios) drilled in the Peruvian Andes (Nevado Chachani) and at a Mexican volcano (Iztaccíhuatl). Permafrost was found, and dataloggers were installed at Nevado Chachani (5350 m) and at Iztaccíhuatl (4700 m).



*Drilling at Nevado Chachani (5350 m), Peru (photo: K. Yoshikawa).*

Beth Astley reports that in 2010, the **Cold Regions Research and Engineering Lab (CRREL)** collected ground resistivity, GPR, and helicopter frequency domain electromagnetic (HFEM) data from a geophysical test area on Fort Wainwright, Alaska, and modeled the permafrost in three dimensions. The HFEM survey was completed over two test lines in conjunction with Fugro Airborne Surveys Corp and the USGS in order to assess HFEM for permafrost mapping. The results of these efforts will be presented at the Symposium on the Application of Geophysics to Environmental and Engineering Problems (SAGEEP) in April 2011. Contact Beth Astley, [Beth.Astley@us.army.mil](mailto:Beth.Astley@us.army.mil) for more information. Kevin Bjella reports that in December 2010, tests were conducted to determine the feasibility of underground excavation in fine grain permafrost in Fairbanks, Alaska. In February and March of 2011, an underground horizontal excavation was initiated at the CRREL Permafrost Tunnel in Fox, Alaska. This new passage runs parallel to the existing adit, is 60 m distant with a cross-section of 4.5 m × 4.5 m, and the length was terminated at 29 m. This new adit passes primarily through late Pleistocene Yedoma and encounters very large wedge ice, supra-wedge ice, many distinct organic horizons, and many woody fragments. Further excavation is planned for the winter of 2011–2012. Ground penetrating radar surveys, capacitively coupled resistivity surveys, and boreholes were conducted at the Great Kobuk Sand Dunes in northwest Alaska. The studies were conducted during a NASA funded project lead by the Southwest Research Institute to determine the applicability of the dunes as an analogue for Martian dune mobility. Temperature instrumented test embankments were installed at Thule Air Force Base in Greenland to study the effect of varying thickness of buried insulation on the depth of the permafrost table in coarse grain fill. This information will help maximize planned reconstruction efforts at the Air Base.



The **U.S. Geological Survey** (J. Abraham, M. Walvoord, B. Minsley, and B. Smith, USGS-Denver; J. Cannia USGS-Lincoln) undertook a helicopter frequency domain electromagnetic (HFEM) survey in July 2010 of the area of Fort Yukon, Alaska, for the purpose of mapping the distribution of permafrost. This study maps the distribution of permafrost in selected areas near Fort Yukon in order to develop hydrogeologic information and interpretation for development of a groundwater model in the Yukon Basin. An additional benefit is the collection of an anchor dataset of 3D permafrost distribution, which can be compared to future similar data collections to determine a volumetric change over time, which in turn can be correlated to climate change. Approximately 1800 line kilometers of data were acquired in typical block style near Ft. Yukon and in long reconnaissance lines along

the Yukon River flood plain and the Porcupine River tributary. Such surveys conducted in other parts of the Arctic region will enable comparisons and contrasts of permafrost distribution on a worldwide scale.

Nikolay Shiklomanov (**George Washington University**) reports on the GWU/UD—CALM III activities in Alaska. The 2010 field team consisted of Dima Streletskiy (GWU), Anna Klene (**University of Montana**), Fritz Nelson (University of Delaware), Cathy Seybold (**USDA**), three GWU students (E. Hatleberg, K. Nyland, and E. Upin), and Josh Dugat, a teacher from New Orleans who participated through the **PolarTREC** program. 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. Marianne Okal (**UNAVO**) worked with the team to create a high-resolution survey of polygonal tundra in Barrow, using ground based LIDAR. In April 2011, Jim Doolittle (**NRCS**), Fritz Nelson, John Kimble (**NRCS**) and Ken Hinkel (University of Cincinnati) completed a ground-penetrating radar survey of the same area. Together, these data sets will facilitate construction of a three-dimensional, high-resolution representation of polygonal terrain underlain by active ice wedges.

Fritz Nelson (**University of Delaware**) reports that Melanie Schimek completed her MS thesis, “Topoclimatic Influences on Active-Layer Thickness in Northern Alaska.” Dima Streletskiy completed and defended his PhD dissertation, “Spatial and Temporal Variability of Active-Layer Thickness at Regional and Global Scales” and is currently working as a postdoctoral scientist at George Washington University. He will assist several GWU students in conducting a variety of permafrost-related activities as a part of the continuation of IPY permafrost courses in Russia organized by Department of Cryolithology and Glaciology of Faculty of Geography, Moscow State University. Mark Demitroff continues study of periglacial features in the Mid-Atlantic region, and plans to finish his doctorate in early 2012.

Tingjun Zhang at the **National Snow and Ice Data Center** of the University of Colorado at Boulder and Oliver Frauenfeld from **Texas A&M Geography** continue jointly to investigate changes in permafrost temperatures, active layer thickness, and talik formation using historical Russian soil temperature data. Zhang, Lin Liu, and J. Wahr (Cooperative Institute for Research

in Environmental Sciences) investigated the possible changes in active layer thickness on the North Slope of Alaska by detecting surface deformation using InSAR data. Their results indicate that ground surface might have settled down about 1 to 4 cm from 1992 through 2000 over the lower Kuparuk River basin, equivalent of approximately 2 to 8 cm increase in active layer thickness over the same period. Zhang is supported by Chinese Natural Science Foundation to investigate frozen ground and hydrological processes over the upper reaches of Heihe Basin in Qilian Mountains in western China. Zhang continues to serve as a lead author for the IPCC 5th Assessment Report due in 2013. He is in charge of changes in frozen ground for chapter 4 and changes in soil temperatures in chapter 2. K. Schaefer (NSIDC) reports on new research, published in *Tellus*, indicating that rising temperatures may result in the thaw Arctic permafrost and release  $190\pm 64$  Gt of carbon to the atmosphere by 2200, amplifying warming due to the burning of fossil fuels and influencing global emission reduction strategies. This release of carbon will amplify warming due to fossil fuel emissions, accelerating permafrost thaw and initiating a positive Permafrost Carbon Feedback (PCF) on climate. By 2200, a 29–59% decrease in permafrost area and a 53–97 cm increase in active layer thickness is predicted. By 2200, the PCF strength in terms of cumulative permafrost carbon flux to the atmosphere is  $190\pm 64$  Gt C. Schaefer et al. predict that the PCF would irreversibly change the Arctic from a carbon sink to a source after the mid 2020s and is strong enough to cancel 42–88% of the total global land sink.

Teams lead by Ken Hinkel (**University of Cincinnati**), Yongwei Sheng (**UCLA**) and John Lenters (**University of Nebraska-Lincoln**) continued their work on thermokarst lakes on the Arctic Coastal Plain of northern Alaska. Water temperature profile measurements were collected from 12 Arctic lakes in summer 2010 as part of a network of lakes being studied. The lakes are underlain by permafrost and extend inland across some 150 km—from the Arctic coast near Barrow southward to the foothills of the Brooks Range. Regionally, lake water temperature patterns over the area are concordant and demonstrate rapid warming in late June and mid-August, with significant synoptic-scale cooling in the second week of August. Locally, ice meltout occurs about 2–4 weeks later on lakes near the coast due to lower temperatures and cloudy conditions associated with maritime conditions. Developed in flat-lying marine silts, the coastal lake basins tend to be shallow (2–3 m) and of uniform depth; strong and persistent winds limit thermal stratification, and mid-summer (1 July–15 Aug) near-surface water temperature averages  $6.8^{\circ}\text{C}$ . About 100 km further inland, in the sandy rolling topography near Atkasuk, lakes are characterized by broad shelves and deeper (2–4 m) central pools. Temperature stratification is minor ( $<0.5^{\circ}\text{C}$ ) and occurs only on calm, sunny days; mid-summer surface temperatures ( $11.6^{\circ}\text{C}$ ) are considerably warmer than lakes near the coast. Lakes here and farther south exhibit both diurnal and synoptic-scale variations in temperature. The southernmost lakes are warmest, averaging  $13.0^{\circ}\text{C}$  during the mid-summer period. They are developed in sand dunes and are generally 2–3 m deep. However, where the expanding lake encroaches on a dune flank at an actively eroding bluff, nearshore pools develop that can be 4–7 m deep. At one exposure, ice-rich yedoma deposits were found beneath the aeolian sand. We hypothesize that thawing of ice-rich silty permafrost during lake encroachment into the dune causes ground subsidence and formation of deep pools, and we will be gathering additional field evidence next year.

*Submitted by Oliver W. Frauenfeld, 2009–2010 USPA Secretary*