



2011 Member Activities Report

TICOP Proceedings. The USPA is involved in editing papers for the Tenth International Conference on Permafrost (TICOP). Ken Hinkel is serving as Editor to coordinate the review of the 86 English-language papers that were submitted in October 2011. Of these, the first author is American on 33 (38%) papers. The 17 Associate Editors, representing discipline subtopics, have requested two reviews for each paper. All TICOP paper reviews are due near the end of November, and a subset of Associate Editors met before AGU to discuss issues related to publication of the Proceedings. The final version of all submitted papers is due on 1 February 2012.

The 2011 Fall Meeting of the American Geophysical Union took place in San Francisco, California, December 5–9. Over 20 oral and 26 poster sessions included permafrost related presentations, which were distributed over ten AGU sections and focus groups.

The USPA Annual Meeting was also held during the 2011 AGU Fall Meeting. The reception and the following agenda attracted a national and international crowd. Oliver Frauenfeld succeeded Torre Jorgenson as the USPA President. Thomas Douglas was appointed to Treasurer, Michael Lilly as President-Elect, and Mike Waldrop as a board member at-large. This year the meeting was also accessible live on the web through WebEx. Many of the attendees were early career permafrost researchers, which were informed about several travel grant opportunities to attend TICOP in Salekhard.

The USPA membership increased its student representation from 15 to 18 graduate and undergraduate fellows since 2010. As a whole, USPA had 104 paying members as of early December 2011, which is up from 95 in 2010.

USPA education and outreach activities were supported by the organization's educational funds; the Permafrost Young Researcher's Network (USPA-PYRN) Educational Fund, the University of Alaska Educational Fund (USPA-UAF) and the Permafrost and Engineering Educational program (PEEP). USPA continued to offer travel support to early career permafrost researchers attending the AGU Fall Meeting. The travel grants, which were supported by the PYRN and UAF Educational funds, were awarded to Benjamin Abbot, Amanda Barker, Katrina



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Bennett, Elchin Jafarov, Miriam Jones, and Susan Natali. The winners received their check during the USPA Annual Meeting in San Francisco. The PEEP Educational Fund received its first application to its K-12 education program, which aim to provide support to science teachers in permafrost engineering education. The goal of this program is to introduce the importance of permafrost engineering issues to high school teachers and students.

USPA Past-President James “Jim” Rooney was given the prestigious 2011 Harold Peyton Award from the American Society of Civil Engineers (ASCE). He has had an exemplary 47-year career of cold regions practice and publications in geotechnical studies, planning, engineering, design, construction of civil engineering facilities in cold climates, and for his dedication to advancing engineering practice through ASCE Technical Council on Cold Regions Engineering committee activities. Jim is joining several other USPA members who were past winners of the award for outstanding contributions to cold region engineering.

Vladimir Romanovsky, professor of geophysics, was the recipient of the 2011 Usibelli Award for Research from the University of Alaska Fairbanks. Romanovsky is among the world leaders in permafrost research. He is consistently sought out as an expert in who can explain complicated concepts to both the public and media and is a frequent collaborator with colleagues in a variety of disciplines. As part of his research work during the last five years, Romanovsky has mentored 22 students and nine postdoctoral researchers and has been listed on more the \$10 million in research grants, many of them with an interdisciplinary focus. He also teaches both graduate and undergraduate courses and incorporates his interdisciplinary philosophy into his teaching and service work.



Jim Rooney (center) with ASCE 2011 President Kathy Caldwell and ASCE Executive Director Pat Natale.



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Professor Vladimir Romanovsky is the recipient of the 2011 Usibelli Award for Research. Romanovsky is a specialist in permafrost with UAF's Geophysical Institute and the Department of Geology and Geophysics. UAF photo by Todd Paris.

The American Society of Civil Engineers, ASCE, sponsored the first “Arctic Technology Conference”, which was organized by the same professional societies that do the yearly “Offshore Technology Conference”. The ATE conference attracted more than 1000 attendees. ASCE, through the Technical Council on Cold Region Engineering (TCCRE), has several published monographs and books ranging from the “Quarterly Journal on Cold Regions Engineering” to “Cold Regions Pavement Design”. There are currently 12 monographs in the works. ASCE has currently about 4000 members with interests in cold region engineering. In addition to awarding Jim Rooney the Peyton Award, ASCE honored Don Hayley with the 2011 Canadian American Amity Award.

The ARCSS/Thermokarst project. Breck Bowden reports that the ARCSS/TK (<http://thermokarst.psu.edu/>) was established in 2008 with funding from the U.S. National Science Foundation. The intent of this project is to use a systems approach to address hypotheses about how upland thermo-erosional features influence the structure and function of the foothill and mountainous landscape in the vicinity of the Brooks Range in arctic Alaska. The project involves about 30 collaborating researchers from 11 institutions in the US and Canada. We found that the common thermo-erosional features in the Toolik region are glacial thaw slumps, retrogressive thaw slumps, thermo-erosional gullies, and active layer detachment slides. These features expose soil carbon and nutrients to microbial activity which significantly increases emissions of important trace gases (e.g., carbon dioxide and methane) to the atmosphere and increases export of sediment and nutrients to streams and lakes. When these features form, the original tussock tundra vegetation (*Eriophorum vaginatum*) is replaced over a period of several decades by a shrub-dominated community (*Salix* spp.). Thus, these thermo-erosional features have important long-term impacts on the arctic landscape and human communities. The ARCSS/TK project has engaged in a number of outreach activities including a series of seminars



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on the environmental and human consequences of permafrost degradation. Videos of the seminars have been archived by the Association of Polar Early Career Scientists at <http://www.apecs.is/>.



Thaw slump and sediment plume on the Wulik River (2010). Photo credit: WB Bowden

The Cold Regions Research and Engineering Laboratory, CRREL, through Kevin Bjella, Anna Wagner and Jon Zufelt reports that Phase I of the New CRREL Permafrost Tunnel in Fox, Alaska, is currently being completed. In March of 2011, 28.3 m of the proposed 300 m of new passageways, a refrigeration system, and portal structure were completed. The new excavation is 4.5 m x 4.5 m (w x h) and is planned to connect to the existing Permafrost Tunnel allowing for new studies of warm fine-grain permafrost, and broadening research from the Old Tunnel. Finishing of the tunnel walls to provide research grade surfaces for mapping and sampling is being conducted. The portal structure was completed this summer with retaining walls, vegetation seeding, and final grading.

Geotechnical studies were also completed in the spring and summer at Thule, Greenland. Ground penetrating radar provided good imaging of over 5 m of ice-rich glacio-fluvial sediments, overlying a dipping shale bedrock sequence of the Thule Supergroup. The GPR results correlated very well with core samples and air-rotary drilling. Epigenetic wedges and thick segregated ice was encountered in the drilling, but was not visible in the GPR.

The construction of a permafrost soil warming prototype was completed at the Fairbanks Permafrost Experiment Station (Farmers Loop Road). This joint project with the Department of Energy's Oak Ridge National Laboratory seeks to understand the physical, biological, and chemical changes in permafrost soils when they are heated to 4 °C above ambient conditions, as an analog for climate change. Low energy heaters are inserted to a depth of 4 meters with the lowest meter heated. The 30-meter diameter plot and control area are instrumented with thermistors and the heaters are controlled by a power management system. The heaters were recently turned on and the soil will be heated for the next 18 months.

CRREL also had a 50 year anniversary alumni gathering in 2011 (see photo provided by Jerry Brown).



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The experimental warming plot near Fairbanks. Photo: Jon Zufelt



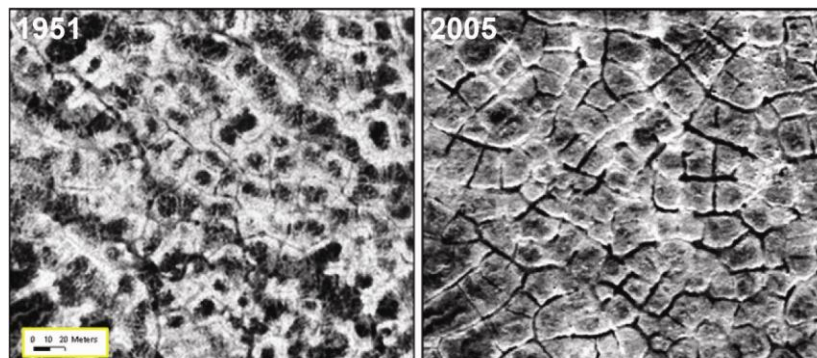
CRREL 50th Anniversary, 2011, Alumni Photo
1-Peter Smallidge 2-Tom Simon 3-Glenn Lotherhand 4-Bill Harrison 5-Nancy Linton 6-Mary Albert 7-Helen Lobacz 8-Bill Quinn 9-Danny Frankenstein 10-Carolyne Morry
11-Ed Chamberlain 12-Don Riedfeld 13-Tom Jenkins 14-Laura Siskauer 15-Ed Link 16-Margaret Foster 17-Jeri Clark 18-Joe Roberts 19-Glenn Ashley 20-Peter Hobbitts
21-George Kottrop 22-Gary Truesher 23-Jim Murray 24-Bob Berg 25-Larry Olson 26-Peter Hayes 27-Gary Feltner 28-Ray Egan 29-Glenn Overmeyer 30-Heri Ueda 31-Lynn Eland
32-Bob Eaton 33-Floeger Berger 34-Glenn Flinders 35-Judy Berth 36-Charlie Clark 37-Wayne Tobason 38-Tony Grew 39-Jerry Danner 40-Caryl Collins 41-Jerry Brown
42-Alexis Gauthier 43-Cleve Hook 44-Gaetano (Tony) Smith 45-Paul Latham 46-Mike Dennis 47-Cleve Smith

Southwest Research Institute® (SwRI®) reports on a wide variety of investigations they have undertaken of Kobuk Valley National Park with either NASA Mars Fundamental Research or SwRI Earth Observation Systems for Climate Change Impact Assessments internal research initiative funding. At both the 42nd Lunar and Planetary Science Conference and the 5th International Conference on Mars Polar Science, Cynthia Dinwiddie reported on ground-penetrating radar, capacitively coupled resistivity, and borehole surveys of the Great Kobuk Sand Dunes that were conducted in March 2010. The frozen active layer was very clearly imaged throughout the dune field, and the presence of near-surface unfrozen water beneath the active layer was confirmed with borehole data. Staff also collected *in situ* meteorological, particle flux, and subsurface ground temperature data at the dunes for a period of 15 days. These data and their interpretation will be presented in a paper (now in draft) to be submitted to the journal *Sedimentology*. At the Great Kobuk Sand Dunes, Don Hooper observed and documented the late-winter state of niveo-aeolian deposits, denivation forms, and debris flows on lee slopes. Results may have implications for analogous deposits and processes on Mars, and will be presented at the 2011 American Geophysical Union (AGU) Fall Meeting and in an article in preparation for the 5th Mars Polar Science special issue of the journal *Icarus*. Stuart Stothoff led development of a slope stability risk assessment tool for permafrost terrain, and will present results at the 2011 AGU Fall Meeting and the 2012 10th International Conference on Permafrost. Marius Necsoiu has spearheaded remote sensing analyses of processes and landforms in Kobuk Valley National Park, culminating in a 2.5-m ALOS-PRISM-based digital surface model of land



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topography for a portion of the Kobuk lowlands; a time-series of ALOS-PALSAR soil moisture retrievals (manuscript in review at *IEEE Geoscience and Remote Sensing Letters*); and development of high-resolution orthorectification and co-registration and active-contouring change-detection techniques for analysis of thermokarst thaw lake surface-area change. The earliest historical aerial photographs have been successfully co-registered with modern satellite imagery, enabling analyses that span the entire period of record (1951 to present). One significant outcome of this work was the observation that vast areas of low-centered polygonal ponds present in Kobuk Valley in 1951 have rapidly transitioned to high-centered, dry polygonal peat plateaus surrounded by water-filled trenches where massive wedge ice has degraded. These results will be presented in a paper (now in draft) to be submitted to the journal *Permafrost and Periglacial Processes*.



Kobuk Valley polygonal ground. The 26 August 1951 image illustrates an example of low-center polygon ponds. Fifty-four years later (18 August 2005 image), the polygon troughs have deepened and are now wetter than the high-standing centers of the polygonal peat plateaus. Image credits: U.S. Navy KBV (1951) and QuickBird panchromatic image 101001000474C60A (2005).



Southwest Research Institute's field team at Great Kobuk Sand Dunes in March 2010. L to R: Donald Hooper (SwRI), Kevin Bjella (CRREL), David Stillman (SwRI), Cynthia Dinwiddie (SwRI), Ronald McGinnis (SwRI). (photo: Seth Kantner)



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University of Virginia, through Gerald “J.J.” Frost and Howard Epstein, undertook a field study in northwest Siberia that focused on interactions between cryogenic disturbance and proliferation of tall alder shrubs in patterned-ground. Major findings were that (1) differential frost-heave maintains mineral-dominated microsites that strongly facilitate recruitment of boreal shrubs in warmer parts of the Low Arctic; and (2) shrub expansion causes sharp declines in active layer temperature and breaks down microsite thermal gradients that are required to sustain differential frost-heave. Thus, shrubland development has important implications for permafrost because canopy shading and the formation of an organic mat strongly buffers the active layer from climate change. Shrubification also diminishes cryogenic disturbance regime, by eliminating the potential for differential frost-heave. This work would not have been possible without cooperation from Russian colleagues at the Earth Cryosphere Institute and Moscow State University. As luck would have it, the field site is within a stone’s-throw of Salekhard, venue for the Tenth International Conference on Permafrost (TICOP), so J.J. and Howie plan to revisit the field site after the conference next year.



University of Virginia permafrost researchers in Russia 2011.

Alaska Ecoscience and others. A study on ice-wedge degradation funded by NSF was initiated in 2011 and included fieldwork at four main sites: Prudhoe Bay, Jago River, Itkillik River (see photo), and Eielson. The research focuses on feedbacks controlling the degradation and stabilization of ice wedges through varying phases of water impoundment and vegetation recovery. Fieldwork included measurements of surface microtopography with ground-based LIDAR, sampling of soil stratigraphy and ground ice (photo of Itkillik yedoma), installation of micro-climate data loggers, and vegetation sampling (photo of vegetation sampling in collapsing trough). Members of the team include Yuri Shur, Torre Jorgenson, Misha Kanevskiy, and Kim Wickland. The U.S. Fish and Wildlife Service collaborated at the Jago site and the work included several students.



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Monitoring of permafrost characteristics and degradation associated with coastal ecosystems on the Yukon-Kuskokwim Delta (see photo) was initiated in 1994 and continued in 2011. The monitoring includes a network of topographic transects, vegetation and soil plots, sediment and salinity stations, soil temperature and water-level recorders, and permafrost exposures (see photo). A time-series of airphotos and newly acquire high-resolution satellite imagery have been georectified to quantify rates of permafrost degradation. Team members include Torre Jorgenson, John Terenzi, and Craig Ely.



The **Geophysical Institute Permafrost Laboratory** research team in collaboration with Russian colleagues continued the development 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. Additionally, during the 2011 summer field work, thermal conductivity and moisture of active layer soils have been determined at the 5 selected sites in northern Yakutia. Results of measurements have been



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submitted to the AON Cooperative Arctic Data and Information Service portal. Russian-US TSP project web portal was established as a part of GI Permafrost Laboratory web site. Detailed description of each observation point, links to the collected data as well as information about ongoing research are posted on this web portal (http://www.permafrost.gi.alaska.edu/sites_map).

Reginald Musket continued research investigations of energy and mass changes associated with changes in permafrost across the Northern Hemisphere. This investigation applies methods and techniques from satellite geodesy with multi-satellite and sensor systems. Surface energy changes are derived using the Moderate Resolution Imaging Spectroradiometer (MODIS) for land-surface temperature change, Advanced Microwave Scanning Radiometer –E (AMSR-E) for soil moisture and snow water equivalent changes, Special Scanning Microwave / Imager (SSM/I) and Scanning Multi-Channel Microwave Radiometer (SMMR) for snow water equivalent, Atmospheric InfraRed Sounder (AIRS) (includes the Atmospheric Microwave Sounding Unit) for atmospheric and near-surface carbon dioxide changes, the Gravity Recovery and Climate Experiment (GRACE) for near-surface water equivalent mass changes (groundwater and total water storage change), the Ice Cloud and land Elevation Satellite Geoscience Laser Altimeter System (ICESat GLAS) for land and water surface elevation changes and the Global Positioning System (GPS) with the International Terrestrial Reference Frame Network for land-surface elevation changes and isostatic glacial changes.

Guido Grosse continued fieldwork on the northern Seward Peninsula, Alaska, in June 2011 on thermokarst lake dynamics (together with B. Jones). Recently drained lake basins were visited and several lake and permafrost temperature monitoring stations were maintained or installed. Results from ending NASA and NSF projects on thermokarst lake and carbon cycling dynamics are in the write-up stage and several publications have already appeared in various peer-reviewed journal. A small Arctic LCC project has resulted in a dataset of potential future lake drainage on the Alaska Arctic Coastal Plain (together with B. Jones). New funding for permafrost and thermokarst related research in 2011 and beyond became available through the U.S. Fish and Wildlife Service and National Park Service (lake and permafrost dynamics in the Western Alaska LCC region and two Arctic National Parks; together with V. Romanovsky), NSF Arctic Observatory Network (Towards a circumarctic lakes observation network – CALON; starting on the Alaska Northslope; together with K. Hinkel, C. Arp, B. Jones, and others), and NASA Carbon Cycle Sciences (Lake methane emissions from thermokarst lakes in North America; together with K. Walter Anthony and others).





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The George Washington University: The 2011 Circumpolar Active Layer Monitoring (CALM) project field activities were conducted in Alaska and Russia. The Alaska field team consisted of Dima Streletskiy (GWU), Anna Klene (University of Montana), Fritz Nelson (University of Delaware) and three GWU students (K. Nyland, J. Butler, C. Cohen). Annual active-layer, ground temperature observations were conducted 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 installed new temp/RH loggers and conducted a series of interviews in Barrow as a part of ongoing project focusing on changes in ground thermal regime in traditional Inupiat ice-cellars. The GWU CALM project has facilitated annual observations at 86 Russian sites. All data are available at CALM webpage at www.udel.edu/Geography/calm. Preparations are underway for the joint CALM/TSP workshop to be organized within the framework of the Tenth International Conference on Permafrost.

Dima Streletskiy together with Valery Grebenets (Moscow State University) and Nikolay Shiklomanov organized International Permafrost Class on Permafrost in summer of 2011 in Central Siberia along the Yenisei River. Three GWU and 12 MSU students participated in the class. Students were introduced to methods of permafrost investigations in natural and technogenically modified landscapes, including site evaluations, temperature and active-layer monitoring and coring. The emphasis was made on relations between permafrost and other components of Arctic natural system. Socio-economic problems of development in permafrost regions were extensively covered throughout the course.

The George Washington University junior Kelsey Nyland was awarded the Rice Fellowship to study North American past cryogenic weathering and relict permafrost-related features. The research is utilizing the Coefficient of Cryogenic Contrast (CCC) analysis to quantitatively evaluate characteristics of paleo-permafrost using mineralogical properties of the substrate.

We have continued to develop methodology for quantitative evaluation of socio-economic impacts of permafrost degradation. Over the last year we have broadened this research by including political, economic, and demographic issues related to development of Russian permafrost regions. Three master thesis related to those issues are currently under preparation at GWU Geography department. An interdisciplinary Arctic research group was formed at the Institute for European, Russian and Eurasian Studies within the GW Elliot School of International affairs to facilitate the research of complex interactions between climatic, political, and economic drivers of changes in Russian urban permafrost-affected communities.

D. Streletskiy was instrumental in organizing permafrost-related sessions for the 2011 and 2012 Annual meetings of the Association of American Geographers.



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GW undergraduates Clayton Cohen (left), Jacob Butler (center) and Kelsey Nyland (right) are all geared up to do CALM thaw depth measurements on the Prudhoe Bay Oil Field.



The George Washington University Faculty and Students in the Permafrost Tunnel in Igarka, Russia. Top Row left to right: Nikolay (Kolia) Shiklomanov, Colin Reiser, Kelsey Nyland. Bottom Row: Genevieve Parente and Dmitry (Dima) Streletskiy.

Cooperative Extension Service, University of Alaska. Recently, it was learned by Professor Rich Seifert of the University of Alaska Cooperative Extension Service that the resources and publications of the former Permafrost Foundation of Alaska had been transferred to the Cold Climate Housing Research Center (CCHRC) in Fairbanks, for safekeeping and archival storage. The Permafrost Foundation has been disbanded and their website (www.permafrost.org) has also disappeared from the Internet. When Seifert discovered that the two unique Permafrost



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Foundation manuals were no longer available either on the internet, he inquired as to whether CCHRC was intending to place them on their website. They weren't planning on it, so Seifert placed them, with CCHRC permission on his UAF Extension website and they are here:

http://www.uaf.edu/ces/energy/housing_energy/resources/Permafrost-design-manual.pdf

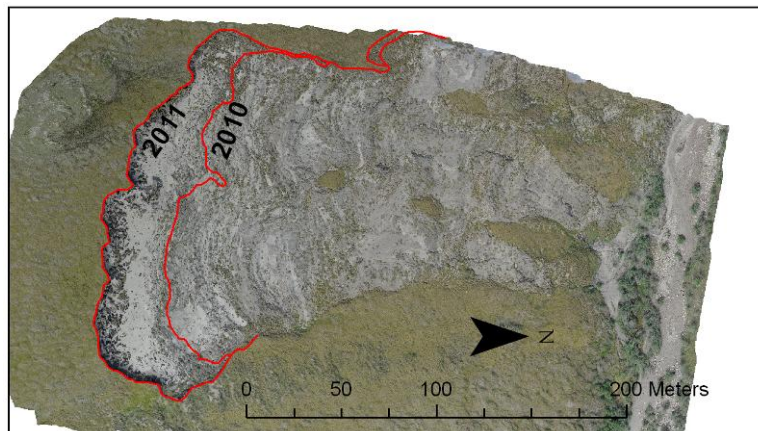
and here:

http://www.uaf.edu/ces/energy/housing_energy/resources/PermafrostNewFoundations.pdf

This makes these manuals written by emeritus professors Terry McFadden and Tom Kinney available on the web again through the public service arm of the University of Alaska Fairbanks. The manuals are also available through this web site:

<http://www.uspermafrost.org/education/PEEP/ptf-manuals.shtml> , which is the US Permafrost education web site.

The National Park Service, Fairbanks, AK, through Dave Swanson, has begun implementation of a permafrost monitoring program in the 5 NPS units in northern and northwestern Alaska. Recently completed mapping using 1-m resolution IKONOS satellite imagery (years 2006-2008) located 848 active-layer detachments and 276 retrogressive thaw slumps (RTS) across the Noatak National Preserve (2.7 million ha). Three-dimensional photo-monitoring of 18 RTS in 2010 and 2011 revealed rapid growth of individual slumps. Slumps grew by escarpment retreat of over 20 m between 2010 and 2011 in 7 of the slumps.



Orthophotograph of a retrogressive thaw slump in the Noatak National Preserve that grew by scarp retreat of up to 40 m between 2010 and 2011.

Water and Environmental Research Center, University of Alaska, through Kenji Yoshikawa, has involved 195 communities in the permafrost/seasonal frost outreach network, which now include almost all of the Alaskan permafrost-occupied communities as well as Little Diomedé, St. Lawrence Islands, and seasonal frost in Southeast Alaska and Aleutians. For the ten whaling communities, temperature sensors were installed in the native meat storages Sigluaques (ice cellar). The results will be published in a ground temperature book in 2012 and distributed to the communities. As part of this program, permafrost lectures are developed for K-12 students that



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will include *TunnelMan* series and the frost tube protocol (http://ine.uaf.edu/werc/projects/permafrost/frost_tube.htm). Yoshikawa and a group from the Universidad Complutense Madrid (including D. Palacios), the Universidad Nacional Autónoma de México (UNAM) drilled in a Mexican volcano (Iztaccíhuatl) at 5000 masl. Yoshikawa also traveled to the Peruvian Andes (Nevado Chachani; 5350m) with the Universidad Complutense Madrid and Instituto Geologico Minero y Metalurgico (INGEMMET), Peru.



Kenji is explaining the frost tube for high school kids at Hollis, Southeast Alaska.



Kenji drilling at Iztaccihualt, Mexico, at 5000 masl.