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United States Permafrost Association – Formed in 2002

Cool Bits From Those Who Do It In the Tundra!

A program focused upon the freshwater cycle of the Arctic Basin has been funded by the U.S. National Science Foundation under the SEARCH program (http://psc.apl.washington.edu/search/). The 'Arctic Freshwater Cycle: Land/Upper-Ocean Linkages' (or referred to as the 'Freshwater Initiative') combines terrestrial and marine hydrology to better understand the arctic hydrologic cycle. Many of the projects under this program address the goals of the Arctic-CHAMP program. The primary aim of Arctic-CHAMP is to catalyze and execute the necessary interdisciplinary research in order to construct a holistic understanding of arctic hydrology. Four primary science goals guide the effort, to: Assess and better understand the stocks and fluxes within the arctic hydrologic cycle. Document natural variability in and changes to the arctic water cycle. Understand the sources of natural variability and causes of arctic water cycle change and assess their direct impacts on biological and biogeochemical systems. Develop predictive simulations of the response of the earth system and human society to feedbacks arising from natural variability and progressive changes to the arctic hydrological cycle. For more information on the Freshwater Initiative, visit http://arcticchamp.sr.unh.edu/index.shtml .

Numerous studies related to permafrost hydrology have been initiated or continued at the University of Alaska Water and Environmental Research Center. These include studies on the impacts of water removal from tundra ponds (http://www.uaf.edu/water/projects/NorthSlope/lake_recharge/index.html), assessing the changes in water resource use on the Seward Peninsula for the last century (http://www.uaf.edu/water/projects/ICWHA/ICWHA.htm), and assessment of wildfire in tundra watersheds (http://www.uaf.edu/water/projects/tundra_fire/tundra_fire.htm). Several of UAF WERC scientists are also involved in the 'Arctic Freshwater Cycle: Land/Upper-Ocean Linkages' (or referred to as the 'Freshwater Initiative'), (http://arcticchamp.sr.unh.edu/). UAF WERC researchers have been conducting hydrological studies in the Kuparuk River watershed, located in the continuous permafrost of Northern Alaska continuously since 1984. Many of the products resulting from this study are available via http://www.uaf.edu/water/projects/NorthSlope/northslope.html.

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Individual Reports

(compiled by Lynn R. Everett, Everett.2@osu.edu)

Glacio-Climatologic and Environmental Monitoring Research in Siberian Altai and South Tibet

Vladimir Aizen
University of Idaho

Two 175 m surface to bottom 9.5 mm in diameter ice-cores recovered from the Belukha Plateau at the Siberian Altai (49°48' N, 86°32'E, 4130 m a.s.l.) in August 2003. Frozen ice-cores have been delivered to the University of Idaho's newly equipped freezer/cold laboratory for further processing and analysis. The 175 m cores may have up to 2,000 ±100 years of climatic and environmental records.

One 21 m shallow snow/firn core 8 cm in diameter recovered from the Bomi glaciation area at the Southern Tibet (29°19'N, 96°47'E, 6100 m a.s.l.) in October 2003. The GPS grounded glacio-geomorphological survey at two local glacier basins of the Palong Zangbu River and water geochemistry sampling have been accomplished. Two Campbell Sci. automatic weather stations were reloaded for the second year observation (2003/2004) at 4800 and 5800 m a.s.l. For more information contact Professor Vladimir Aizen at aizen@uidaho.edu

Tundra Access and Ice Roads

Larry Bryne
Alaska Department of Natural Resources (DNR)- Fairbanks

I and two others do field work in the North Slope oil fields around Prudhoe Bay . One of our main duties is to determine when the tundra is 'sufficiently hard' to allow off road travel for the purpose of seismic exploration, oil field development and maintenance. The criterion which DNR follows for opening the tundra is 6" of snow and 12" of ground frost. We determine the extent of ground frost with a hand operated slide hammer penetrometer. Over the past 30 years the exploration season has decreased by over 100 days because the tundra has been slower to harden in the winter. All this serves an introduction to a project in which we participated with Conoco Phillips Alaska (CPA) over the past year.

In order to reach exploratory sites oil companies will often build ice roads. Last winter Conoco Phillips Alaska's (CPA) requested that DNR allow them to determine when the tundra was sufficiently hard enough to construct an ice road. Using rolligon-mounted hydraulic equipment (cone penetrometer and plate indentation test) CPA determined they could begin construction any time after 17 December. DNR allowed the construction of a mile section of 'demonstration' ice road begun on 20 December. On 20 Jan DNR determined that there was sufficient snow cover and the tundra was hard enough for off road travel. At that time the rest of the approximately 25 mile long ice road was built.

This past summer DNR in conjunction with ABR, an environmental consulting company hired by CPA, sampled the 'demonstration' section of ice road and the adjacent mile section of 'standard' ice road to determine what deleterious effects to the tundra, if any, occurred as a result of early ice road construction. Besides vegetative parameters, physical variables such as relative elevation, penetration depth, active layer depth, soil moisture and water depth were investigated. Individual sedge tussocks were also rated for type and extent of damage.

Results were presented at a Tundra Access Symposium hosted by the Alaska Oil and Gas Association in October 2003 in Anchorage.

Current Status of Work in NPRA

Gary Clow
U. S. Geological Survey

Gary completed logging the 21 NPRA deep borehole array, downloaded data loggers from the soil temperature, active-layer network, added soil moisture sensors to nearly all the stations, and installed three new stations (two in NPRA and one in ANWR) as its contribution to the Global Terrestrial network for permafrost (GTN-P). More information is available by contacting Gary Clow at clow@usgs.gov.

Possible Occurrence of Methane Hydrates at the Base of the Permafrost Layer Found on the North Slope, Alaska

Tom Douglas
Cold Regions Research and Engineering Laboratory

Tom Douglas of the Cold Regions Research and Engineering Laboratory, Mark Conrad and Katharine Woods of the Lawrence Berkeley Laboratory in California and Shirish Patil of the University of Alaska Fairbanks have been working on permafrost core samples from the North Slope of Alaska. Mark Conrad gave an oral presentation of some of this work at the American Geophysical Union Fall Meeting in San Francisco in December 2003. The goal of our work, still in the formative stages, is to better understand the stable isotopic regime of methane hydrates. Specifically, we would like to better understand the stable isotopic conditions within which methane hydrates are stable. We have been measuring carbon and hydrogen isotopes of organic matter and oxygen and hydrogen isotopes of interstitial water from the permafrost core samples in support of this work. We believe the results will help in development of an isotopic monitoring tool for methane hydrate stability. The work is ongoing. A copy of the AGU abstract follows.

AGU Abstract:

Anadarko Petroleum Corporation, Maurer Technology, and the U.S. Department of Energy drilled the Hot Ice #1 borehole on the North Slope of Alaska during March/April of 2003. Its purpose was to explore for the possible occurrence of methane hydrates in the base of the thick permafrost zone present on the North Slope. The borehole reached a depth of 425 m, passing through the bottom of the permafrost at about 380 m. The entire hole was cored, with core recovery exceeding 90 percent. The bedrock geology consists

of interbedded sequences of siltstone, conglomerate, sandstone, coal and shale with some bitumens and/or ice lenses. The borehole represents an ideal opportunity to study geochemical signals present in the North Slope permafrost. Thirty samples, obtained over the entire length of the core, were collected for isotopic analyses and are currently being analyzed at the Center for Isotope Geochemistry at the Lawrence Berkeley National Laboratory. The samples were chosen to best determine whether any broad isotopic trends exist within the permafrost. Measurements are being made of the hydrogen and oxygen isotope ratios of the ice and the carbon isotope ratios of carbon dioxide trapped in the permafrost. In addition, the carbon isotope ratios of any methane contained in the samples will also be determined. Preliminary results for the oxygen isotope compositions of the permafrost yield ^{18}O values ranging from -18‰ to -22‰ with a general trend towards lower values in the deeper part of the core. The concentrations of the CO_2 in the samples (possibly representing dissolved inorganic carbon in the pore water?) range from 0.6 to 2.5 millimoles/liter with concentrations increasing with depth. The ^{13}C values of the CO_2 range from -7‰ to -27‰ with the lowest values in the higher concentration, deeper samples. This trend is consistent with increasing inputs of CO_2 derived from hydrocarbons/hydrates with depth and may yield insight into the affecting methane hydrate formation within the permafrost.

Collaborative Research: Preliminary Investigation of Paleoenvironment, Processes, and Carbon Stocks of Drained Thaw-Lake Basins, Arctic Coastal Plain, Alaska

Wendy Eisner[1], Jim Bockheim[2], Ken Hinkel[1], and Richard Beck[1]
[1]Department of Geography, University of Cincinnati
[2]Department of Soil Science, University of Wisconsin Madison

Wendy R. Eisner, Kenneth M. Hinkel, and Richard A. Beck, University of Cincinnati, in collaboration with James G. Bockheim, University of Wisconsin Madison, received a grant of $249,924 from the National Science Foundation's Office of Polar Programs for the period April 2003 through March 2005. The award, titled, "*Collaborative Research: Investigation of Paleoenvironment, Geomorphic Processes, and Carbon Stocks of Drained Thaw-Lake Basins, Arctic Coastal Plain, Alaska*", builds on work done on the Barrow Peninsula during the period 2000-2002.

This is a study of the origin and associated geomorphological, ecological, and pedological processes of thaw lake basins of the Arctic Coastal Plain, Alaska. The research uses high-resolution multispectral satellite data, ground-penetrating radar, and extensive coring to estimate the amount of carbon sequestered in the drained basins. Radiometric dating, microfossil analysis, and soil development are being used to determine whether carbon accumulation rates respond to regional changes in climate or if they are influenced by local rates of plant succession. We are also working with the Barrow community to investigate the traditional knowledge of local elders, who have primary and secondary information on recent lake drainage and flooding events.

In April 2003, fieldwork was concentrated in the Barrow Peninsula north of the Inaru River, on the Outer Coastal Plain. We visited a total of 5 thaw lake basins within a 20 km radius of Barrow. We also visited 6 sites within a 35 km radius of Barrow which appears to never have been impacted by the thaw lake cycle.

In August 2003, our base of operations was located east of Atqasuk along an ancient backshore beach dune complex, which forms the boundary between the Inner (older) and Outer (younger) Coastal Plain. We sampled paleosol sequences along river bluffs near Atqasuk for laboratory characterization, radiocarbon dating, and recovery of fossil pollen. The paleosol sequences will help elucidate the erosional/depositional history of the Atqasuk region.

In addition, we interviewed and videotaped 5 Inupiat community elders from Barrow and Atqasuk over a period of five days . These were: Mrs. Flossie Itta and Mr. Thomas Itta, Sr. from Atqasuk, and Mrs. Bertha Leavitt, Mrs. Mary Lou Leavitt, and Mr. Ronald Brower, Sr. from Barrow. Our interviewees offered invaluable observations on landscape and climate change, as well as fascinating accounts of their cultural traditions and personal history. We were able to corroborate a number of their observations concerning past lake drainage using both helicopter site visits and satellite imagery.

Construction Methods Suitable for Discontinuous Permafrost

David Esch
Geo Engineers, Inc., Palmer, Alaska

I am currently consulting with Geo Engineers Inc. of Anchorage on a study of the various airports in the Yukon-Kuskokwim region, in a study funded by the Alaska Department of Transportation and titled *Airport Life-Cycle Costs in the Yukon-Kuskokwim Delta*..

Our task is to analyze the various construction methods in use and to recommend the most suitable and economical methods of constructing and maintaining airfield embankments on the discontinuous permafrost of this region, which is underlain primarily by ice-rich organic silts, and which lacks any suitable gravels for the construction of embankments.

Many problems and few solutions!!!

The First Phase of the Circumpolar Arctic Layer Monitoring Program

Ken Hinkel[1], Frederick Nelson[2] and Nikolai Shiklomanov[2]
[1]University of Cincinnati
[2]University of Delaware

The first five-year phase of the Circumpolar Arctic Layer Monitoring (CALM) program was completed, and plans for the second, five-year phase were initiated. Summer 2003 observations continued at many of the 125 circumpolar sites. In Northern Alaska average, grid thaw depths were about the same as in 2002 and, in general, average thaw depths were 10-20 cm below peak averages experienced in 1998. Thickness of the

organic layer was determined by Jim Bockheim, University of Wisconsin, on the seven Alaskan CALM grids. Soil temperature and drift thickness have been monitored since 1997 along the 3.2-km long and 4 m high snow fence. Ground subsidence beneath the drift crest appears to be ongoing, most of the vegetation is dead, and ponding has become more pronounced.
In August, about 70 air and soil temperature loggers were serviced in and around Barrow; these are used to monitor the urban heat island (UHI) effect in the 150 km^2 study area. There is a direct correlation between the UHI magnitude and fossil fuel consumption. Anna Klene is completing her doctoral dissertation on the UHI project.

Permafrost Research in Northern and Central Alaska, Including Studies in the Eastern NPRA

Torre Jorgenson
ABR, Inc.

ABR, Inc. and University of Alaska are continuing their collaboration on permafrost research in northern and central Alaska. Torre Jorgenson and Erik Pullman (ABR) and Yuri Shur (UAF), completed their third field season in the eastern NPRA studying lake basin development, floodplain development, and ice wedge degradation as part of environmental baseline studies funded by ConocoPhillips Alaska, Inc. The work is focusing on quantifying ice, sediment, and carbon stratigraphy within geomorphic units across the landscape. In addition, Ken Karle, Hydrologic Mapping and Modeling, Inc., Yuri Shur, and Torre Jorgenson have initiated a pilot-scale project to evaluate remote sensing techniques for monitoring permafrost changes in central Alaska for the National Park Service. For further information contact Torre at tjorgenson@abrinc.com.

Modeling the Impact of Permafrost and Snow on the Thermal and Hydrologic Regimes of the Arctic

Nicole Mölders[1] And John E. Walsh[2]
[1]Geophysical Institute, University Alaska Fairbanks
[2]International Arctic Research Center, University Alaska Fairbanks

High-latitude terrestrial variables and processes (e.g., permafrost, soil freezing and thawing, snow, moss, lichen, heterogeneity on the micro-scale, interaction of soil moisture and soil temperature states, etc.) have received little systematic study in the context of global climate model simulations, even when fully coupled models are considered. We have performed preliminary studies on the behavior of organic soils and how to simulate them. To simulate more realistically the space-time variations of permafrost and associated impacts on the atmosphere in high-latitudes, the soil-frost and snow modules of the hydro-thermodynamic soil vegetation scheme (HTSVS) were implemented and tested within the offline version of the Common Land Model (CLM) of the NCAR Community Climate System Model (CCSM). The main advantages of the soil module are that it is based on the principles of linear thermodynamics of irreversible processes and includes cross-effects (Ludwig-Soret-effect and Dufour-effect) generated by soil moisture and temperature gradients. These cross-effects have minor effects in many cases, but they become more substantial when soils become dry, or during freeze-

up and melt. According to early results, soils remain wetter when the modified version of CLM is used (Fig. 1).In the future, simulation with and without the inclusion of the soil frost and snow module will be performed with CCSM, wherein the modified CLM will be coupled to CAM. Results of these simulations are to be analyzed and compared to data of permafrost and snow collected at the National Snow and Ice Data Center. As the project evolves, we will address changes in permafrost and associated hydrologic impacts in the context of greenhouse-gas-induced climatic change.

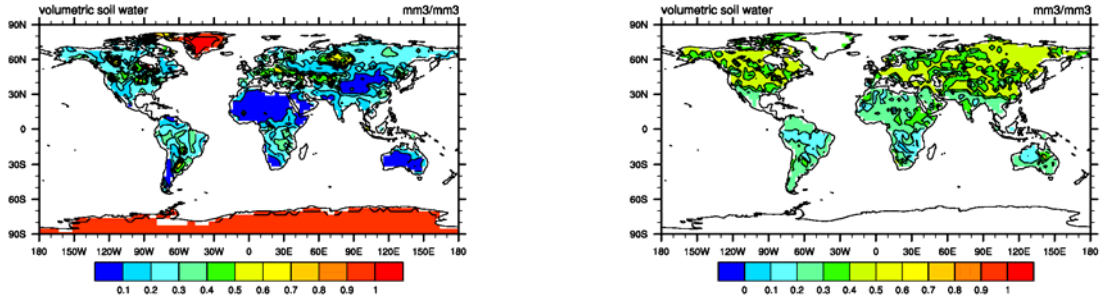

Fig. 1. Simulated soil volumetric water content with the original CLM2 soil/snow treatment (left) and the modified version (right). In the right plot, only those areas are plotted in colors where the modified soil/snow treatment is applied. White areas are treated the same as in the original version of CLM. Results shown are after 1 month of offline simulation starting on 31 December 1997.

Measuring Mass and Energy Fluxes and Real-Time Data Collection

Walter C. Oechel and Kristen Freeman
Global Change Research Group, San Diego State University

Measurements of mass (CO_2 and H_2O) and energy fluxes were conducted using the eddy covariance towers in Barrow (71° 21' 00.00" N:156° 37' 18.53" W), Atqasuk (70° 28' 10.6" N:157° 24' 32.2" W), and Ivotuk (N 68^o 28.978' :W 155^o 45.103'), Alaska. An autonomous power system was recently deployed at Ivotuk, detailed information regarding the Ivotuk tower and power system are available at the web sites: http://gcrg.sdsu.edu/ivo_report.php and http://transport.sri.com/ivotuk. Measurements of environmental variables such as air temperature, net radiation, and precipitation were conducted at three sites as well. The data were collected nearly continuous throughout the field season. The data from three sites has been automatically reported to the web

server at San Diego State University. This provides real-time data collection and processing of mass and energy fluxes. All three sites are validation sites of CO_2 flux for MODIS product over the Arctic region.

A portable eddy covariance tower was deployed to measure mass and energy fluxes at three locations along a transect between Barrow and Atqasuk. The use of this data will provide information on the spatial patterns of the flux throughout the field season. The data collected from the portable eddy tower will be used as ground validation points for the aircraft flux data measured by research aircraft (SDSU Sky Arrow). The measurement of soil respiration was conducted using automatic soil respiration chambers and soil CO_2 concentration was also measured using CO_2 concentration probe at Barrow and Atqasuk sites.

The Recent Warming of Permafrost in Alaska

Tom Osterkamp
University of Alaska Fairbanks

Twenty five years of temperature measurements and research at permafrost observatories along a North-South transect from Prudhoe Bay to Glennallen have shown that there has been a widespread warming of air temperatures in Alaska since 1977 and some warming of permafrost. Constant or cooling permafrost temperatures followed this in the early 1980s, probably due to thin snow covers and a short cooling trend. Permafrost temperatures along a north south transect from Prudhoe Bay to Gulkana and at other sites have generally warmed since the late 1980s, initially in response to thicker snow covers and continues into 2003. The warming north of the Brooks Range (2 to 4 °C) is comparable in magnitude to the century long warming there. The trend has not been followed at Eagle and the Yukon River bridge. Warming of the discontinuous permafrost is typically ½ to 1 ½ °C. Thin discontinuous permafrost is thawing at the base at a rate of 0.04 m per year at one site. New thermokarst and thawing permafrost have been observed at several sites where settling of the ground surface has averaged about 3 cm per year.
For more information contact T.E. Osterkamp at ffteo@uaf.edu or at the Palmer Research Center, 533 E. Fireweed Lane, Palmer, Alaska 99645.

Establishing Biocomplexity Monitoring Sites in Greenland and Fieldwork in the Dry Valleys, Antarctica.

Ron Sletten and Bernard Hallet
University of Washington

During summer 2003, Ron Sletten and Bernard Hallet established physical and chemical monitoring sites at Thule, Greenland. The two sites set up this summer include snow cover manipulation using snow fences and monitoring include micrometeorology, soil temperature (1.2 m depth), TDR (time domain reflectometry), and tension lysimeters. This project is part of a large NSF-funded biocomplexity project led by Jeff Welker at Colorado State University of Washington and includes Josh Schimel from the University of California-Santa Barbara. This was the first year of a 5-year project investigating the

role of physical (e.g. cryoturbation, unfrozen water) and chemical (e.g. lithology, water chemistry) processes on carbon and nutrient cycling and vegetation.

The UW group also conducted the final field season of a NSF-funded project in the Dry Valleys, Antarctica investigating surface ages and turnover due to contraction cracks. They have continuous records of contraction crack dynamics (hourly data) and soil temperature at varying depths up to 20 m; most records are for 5 years and are archived in the CALM database.

Probabilistic Methods in Cold Regions Engineering Design
Ted Vinson
Oregon State University

Ted Vinson continues his work to promote the use of probabilistic methods in cold regions engineering design. He has extended his effort over the past few years to incorporate global climate change predictions. Ted presented a paper related to icing problems on the Denali Park access road at ICOP 2003 in Zurich. He is currently under contract with the Federal Highway Administration to produce an interactive instructional CD (or DVD) on Geotechnical Considerations and Road - Foundation Engineering Practice in Cold Regions.

Biocomplexity of Frost Boil Ecosystems
Donald (Skip) A. Walker
Institute of Arctic Biology, University of Alaska

Skip Walker and a team of 19 scientists and students from the US and Canada completed their second field season investigating the effects of climate on frost-boil ecosystems. The team is funded under the NSF Biocomplexity in the Environment (BE) initiative. This summer the team established three research sites at Green Cabin in Aulavik National Park, Banks Island, and one at Mould Bay, Prince Patrick Island. The objective is to build sites in all five arctic bioclimate subzones. The team is monitoring climate, thaw-layer depth, frost heave, soils, and vegetation characteristics. One objective is to see how the decreased activity of vegetation in colder climates affects frost heave processes, and the size and spacing of frost boils. Other key factors being studied are the role of cryoturbation in sequestering soil carbon, and how biogeochemical cycling of carbon and nitrogen is affected by cryoturbation. Members of the research team included: Howard Epstein and Alexia Kelly (University of Virginia), William Gould, and Grizelle Gonzalez (Institute of Tropical Forestry, San Juan, Puerto Rico), William Krantz (University of Cincinnati), Anja Kade, Chien-Lu Ping, Gary Michaelson, Martha Raynolds, Vladimir Romanovsky, and Skip Walker (University of Alaska Fairbanks), Sarah Harvey (VECO Polar Resources), Charles Tarnocai (Agriculture and Agri-Food Canada). The students participated in an Arctic Field Ecology course taught by William Gould and Grizelle Gonzalez through the University of Minnesota. The students included: Ronnie Daanan, Heather Fuller, Patrick Kuss, Noah Strom, Sean Rea and Adriana Quijano. Logistics for

the field camp were supported by VECO Polar Resources. Next summer the team will return to Mould Bay, and also establish a field site at Isachsen on Ellef Ringnes Island.

Colville Delta, Alaska

H. Jesse Walker
Louisiana State University

The Colville River delta information that has been on the net for a few years now has a new URL as follows: http://louisdl.louislibraries.org. Open, then click "Collections" and "Colville Delta Alaska". The Colville collection has 53 texts, 24 tables/graphs, 50 maps, 1145 photographs and 870 aerial photographs ranging in date from 1947 to 1992. The materials can be searched under 894 subject titles.

Recent activities at the Arctic Ecology Laboratory at Michigan State University

Patrick J. Webber, Robert D. Hollister and Craig E. Tweedie
Michigan State University

The following are highlights of recent activities at the AEL:

- Bob Hollister completed his PhD and is now a research associate in the lab.
- A recent planning meeting for the developing Circum-arctic Environmental Observatories Network was convened at the Royal Swedish Academy of Sciences in Stockholm, Sweden. Attendees represented all eight arctic nations, eleven of the eighteen IASC-member countries, a range of established monitoring networks, field stations, indigenous people's organizations and funding agencies as well as experts from the environmental modeling and remote sensing sciences. All attendees enthusiastically supported the CEON concept. Discussion focused on the disciplinary scope and internal organizational structure of CEON and priorities for future development. These span construction of a website that will include a novel internet mapping, informational and analysis tool, dissemination of brochures advertising the CEON terms of reference, and preparation of funding proposals to sustain the development of CEON. A full report of the meeting will be provided at the new CEON website www.ceoninfo.org by the end of November.

  CEON aims to promote measurement of standardized environmental observations and dissemination of these to Arctic researchers whilst encompassing and building on the strengths of existing arctic research stations and environmental observatory networks. The CEON concept is endorsed by the Forum of Arctic Research Operators (FARO – www.faro-arctic.org) and the International Arctic Science Committee (IASC – www.iasc.no)
- In December, lab personnel will lead 20 undergraduate students to Patagonia and Antarctica on a new MSU study abroad field course. Students will have the opportunity to experience and learn about earth system science in the unique setting of Antarctica. Students will begin this program by traveling to Ushuaia in southern Argentina where they will participate in a series of preparatory lectures before departing on a tourist ship that will take them to the Antarctic Peninsula. While on-board, students will be briefed on science topics such as climatology, oceanography, glaciology, ecology and biology, human geography and field survey methods and

safety. Following arrival back in Ushuaia, students will visit several national parks around Tierra del Fuego in southern Patagonia whilst recapping their experiences in the Antarctic through a series of lectures, group activities and individual projects. Bookings for the 2004-05 class are currently being accepted.

Report on Frozen Ground Studies at the National Snow and Ice Data Center (NSIDC)

Tingjun Zhang and Roger G. Barry
National Snow and Ice Data Center (NSIDC), University of Colorado

There are several frozen ground projects currently underway at NSIDC: (1) historical soil temperature changes in the Russian Arctic and Subarctic, (2) inter-decadal variations of freeze and thaw depths in Russia, (3) response of river runoff to permafrost thawing in the Russian Arctic drainage basin, (4) numerical simulation of talik formation under thaw lakes and talik freeze-up after thaw lake drainage, (5) detecting near-surface soil freeze/thaw cycle using a frozen ground algorithm developed at NSIDC, and (6) the Frozen Ground Data Center.

Zhang and Barry have worked with Russian colleague Dr. David Gilichinsky on Russian historical soil temperature data in recent years. Based on data for the period from 1930 to 1990, soil temperature has increased approximately 0.9 to 1.0^{o}C in Russia. Soil temperature increase was even greater in the permafrost regions. Soil temperature data also show a significant increase in active layer thickness and a decrease in seasonal freeze depth. Increases in soil temperature may potentially result in lateral thawing of permafrost. Results from a one-dimensional numerical model over the Arctic drainage basin show a similar magnitude increase in active layer thickness. An increase in river runoff in the Russian Arctic drainage basin may be partly due to meltwater from the excess ground ice due to the thickening of the active layer and potential lateral thawing of permafrost in discontinuous and sporadic permafrost regions.

A two-dimensional numerical heat transfer model with phase change was developed to simulate the thermal regime of soils under and adjacent to a thaw lake in the Arctic. Simulated results indicate that for a thaw lake with an 800 m diameter, 3 m water depth, and a long-term mean lake bottom temperature of 2^{o}C, a maximum talik thickness of about 43 m may form approximately 3000 years after the formation of the thaw lake in northern Alaska. However, it only takes a few decades for the talik to freeze up after the shallow thaw lake drains due to the significant colder upper boundary condition (based on data from northern Alaska, a mean annual ground surface temperature of -9.0^{o}C was used in the simulation for the talik freeze-up case.)

Based on passive microwave satellite remote sensing data and a one-dimensional numerical model, a frozen soil algorithm was developed at NSIDC to detect the near-surface soil freeze/thaw cycle. The frozen soil algorithm has been validated using available data over the contiguous United States with good agreement. Using the validated frozen soil algorithm, we found that, on average, approximately 55% of the near-surface soil experience seasonal freezing and thawing in the Northern Hemisphere.

In the middle latitudes, near-surface soil often experiences 10 or more freeze/thaw cycles in one winter, with a duration ranging from a few days to a few weeks. In high latitudes, the frequency of the near-surface soil freeze/thaw cycle is reduced significantly but the duration increases substantially.

A Frozen Ground Data Center (FGDC) has been established at NSIDC. Under the guidance of the IPA Standing Committee on Data, Information, and Communication (SCDIC), the Circumpolar Active-Layer Permafrost System version 2 was released during the 8th International Conference on Permafrost at Zurich, Switzerland, in July 2003. CAPS is a major component of the IPA's Global Geocryological Data (GGD) system. FGDC, supported by the International Arctic Research Center (IARC), is a central node in the GGD system. CAPS is intended as a snapshot of FGDC data and metadata holdings as of spring 2003. For more information about the FGDC, please visit http://nsidc.org/fgdc or call at (303)-492-6199.

Studies on Foundations in Permafrost Regimes

Hannele Zubeck
School of Engineering,University of Alaska Anchorage

Past work from the UAA:

The University of Alaska Anchorage continues their studies on foundations in permafrost. This past winter Dr. Zubeck and her team conducted field testing on removable piles that support Hot Ice # 1; the arctic tundra platform that holds the drilling rig and operations for Anadarko Petroleum Corporation's methane hydrate production.

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Web Sites Listed Above:

http://arcticchamp.sr.unh.edu
http://arcticchamp.sr.unh.edu/index.shtm
www.ceoninfo.org
www.faro-arctic.org
http://gcrg.sdsu.edu/ivo_report.php
www.iasc.no
http://louisdl.louislibraries.org
http://nsidc.org/fgdc
http://psc.apl.washington.edu/search/
http://transport.sri.com/ivotuk
http://www.uaf.edu/water/projects/ICWHA/ICWHA.htm
http://www.uaf.edu/water/projects/ NorthSlope/northslope.html
http://www.uaf.edu/water/projects/NorthSlope/lake_recharge/index.html
http://www.uaf.edu/water/projects/tundra_fire/tundra_fire.htm