UNITED STATES OF AMERICA

US Permafrost Association

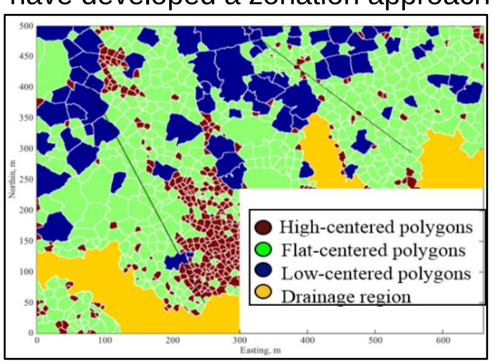
The annual meeting of the US Permafrost Association (USPA) Board of Directors and a general member meeting will be held at the 2014 Fall Meeting of the American Geophysical Union. Current USPA membership includes 37 student members, 58 regular members, and 12 corporate/non-profits/lifetime members, for a total of 107 members and includes several non US members.

Institution Member Activities:

U.S. Army Cold Regions Research and Engineering Laboratory (CRREL) has increased their project activities and facilities investments in permafrost research, particularly in Alaska. Recent investments to the Permafrost Tunnel include the installation of a road for expanded access to the lands above and around the old and new tunnels. At the Farmer's Loop Research site in Fairbanks a series of instrumented 400 meter long transects have been installed to access the variety of terrains available at the site. A large project was recently completed that focused on using remote sensing and geophysical tools to identify areas of high ice content permafrost. New research on infrastructure, isolating ancient DNA, remote sensing, and the biogeochemical signatures of permafrost has been initiated in the past year.

Additional research projects include: Revising the methods to characterize permafrost for infrastructure with collaborators at University of Alaska Fairbanks, University of Cincinnati, the Cold Climate Housing Research Center, and Atkins North America. Cost vs benefit studies on the installation of climate change neutral foundations at Thule AB, Greenland utilizing the actual construction of slab-on-grade 45,000 square foot structure. Rehabilitation alternatives for active infrastructure suffering from thaw-degradation at Thule AB. Large scale permafrost terrain characterization studies for Alaska Dept. of Transportation new roadway alignments.

DOE Next Generation Ecosystem Experiment (NGEE-Arctic): Identifying Functional Zones in an Arctic Tundra Ecosystem using Multi-Scale Datasets **-** Quantifying the spatial distribution of surface and subsurface properties over a range of scales is critical for improved prediction of carbon cycling and ecosystem feedbacks to the climate. This is especially important in vulnerable ecosystems such as the Arctic, which contains a vast stock of soil organic carbon that is locked up in the currently frozen but gradually warming permafrost. Scientists working with the DOE Next Generation Ecosystem Experiment (NGEE-Arctic; http://ngee-arctic.ornl.gov/) project have developed a zonation approach to characterize Arctic polygonal ground functional zones, or regions of the landscape that have unique distributions of surface and subsurface properties that lead to distinct carbon flux signatures. Using geophysical, vegetation, hydrological, thermal, and geochemical data, the team developed a data-driven approach to delineate polygons at the Barrow Environmental Observatory in Alaska (Figure 1) and to assign associated above and below ground properties to the zones. A statistical approach was used to evaluate the relative explanatory power of polygon types (low, flat and high centered polygons) versus polygon features (trough, rim, centers) for describing the spatial variability of those properties. The results indicate that polygon types have more power to explain the variations in properties, including carbon fluxes, than polygon features. This approach is expected to be useful for parameterizing numerical models aimed at predicting ecosystem feedbacks to the climate, as it provides a tractable approach for characterizing multiscale zonation over large Arctic regions. Results from this study will be presented at the Fall AGU meeting in San Francisco (Wainwright et al., B54F-07).



Data-driven delineation of polygon types at the NGEE-Arctic Barrow, AK study site. Multiple data types and a statistical approach were used to document the existence and importance of functional zones, or groups of polygons that have unique distributions of above and below ground properties that influence carbon fluxes.

High Alpine and Arctic Research Program (HAARP) at Texas A&M University has been very active in various research programs. These programs have been focusing on hydrology, mass movement and climate change in the San Juan Mountains of southwestern Colorado. The Uncompaghgre and San Miguel rivers have been studied to document the impact of river restoration on bank stability and post-restoration impact. Two studies have been focusing on the impact of mine tailings and restoration on water chemistry on the Uncompaghgre River. Streams were sampled above mining levels, in mine, on restoration and downstream from restoration efforts. Results indicate that water chemistry about the mines was the same as water chemistry post restoration. In other words, restoration of mine spoils had no impact on downstream water chemistry. A second study is currently collecting both airborne and water samples along a north-south transect to evaluate the impact of elevation and aspect on deposition pathways of airborne particles on watershed and stream chemistry.

A study of the importance of lithology on step –pool formation is being undertaken on various streams in the San Juan Mountains. Another study is using dendrogeomorphology to map movement of a large landslide on the southern side of Ouray, Colorado. In addition, the use of time-domain (TEM) electromagnetics is evaluating the internal structure of a rock glacier and comparing results with ground penetrating radar (GPR) of the rock glacier. In addition, we are comparing GPR images of a rock glacier with an exposed trench in the rock glacier to verify resolution quality.

We have been monitoring air and ground temperatures in the San Juan Mountains. We have been collecting ground temperatures (~ 1 m below grade) at 32 stations within the San Juans. To date we have detected a warming of ground temperatures of ~ 1°C from 1984 -2013.

We are beginning a new program of mapping geomorphology and associated hazards in Denali National Park with the National Park Service. The HAARP has acquired new equipment including a Leica Terrestrial LiDAR, two drones, a 4x4 five-person Teryx, 3 YSI monitors, 3 DR890 Hach Coloimeters, 3 portable weirs and 3 Rickly alpine-stream flow gages.

Geophysical Institute Permafrost Laboratory (GIPL), University of Alaska Fairbanks research team led by Prof. Vladimir Romanovsky continued the development of the observation borehole network for the thermal state of permafrost (TSP) 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. In 2014, ten shallow (10 m) boreholes were instrumented with thermistor strings for continuous temperature measurements along the Alaska Highway between Fairbanks and Tok, Alaska. These boreholes are part of a project involving approximately 120 shallow boreholes that were donated to GIPL by ExxonMobil. The transect of boreholes follows the Alaska Highway from the US/Canada border to Delta Junction and then follows the Trans-Alaska Pipeline System (TAPS) corridor north to Prudhoe Bay. GIPL will continue to instrument and collect data from the selected boreholes for the next 4 years.

GIPL team started a new project entitled "*Use of AIEM permafrost module output to assess the permafrost changes in the 21st century*" funded by USGS Alaska Climate Science Center. The project focusses on modeling the effects of surface disturbances, both natural and anthropogenic, on permafrost thermal dynamics over the entire North Slope of Alaska.

During April – June, 2014, Asso. Prof. Sergey Marchenko, as a member of the International team of permafrost experts, took part in field excursions from Lanzhou, Gansu, China to the Qinghai-Tibet Plateau (along the Qinghai-Tibet Transportation Corridor and upper part of the Yellow River) and to the North East China, area of the Russia-China Crude Oil Pipeline project. During the field work, permafrost, hydrological, and paleo-environmental studies were conducted, and an integrated meteorology-permafrost-hydrology observatory was established at the source of the Yellow River at elevation of 4,450 m. Dr. Marchenko continued with permafrost and hydrological monitoring in the Tien Shan Mountains, Kazakhstan and during September 2014 organized a summer school in collaboration with colleagues from the Institute of Geography of the Republic of Kazakhstan.

As an ERC funded researcher now based at AWI in Germany and in an affiliated position with the GIPL, Dr. Guido Grosse participated with USGS and UAF team members in a three week snow machine expedition on the Alaska North Slope in April 2014 within the NSF AON funded lake observation network CALON, and the ERC project PETA-CARB studying thermokarst and soil carbon dynamics. The team sampled about 30, mostly thermokarst lakes, and drilled multiple shallow permafrost cores from drained lake basins and upland sites. A research highlight was the publication of a Nature paper on thermokarst lakes as a long-term carbon sink (Walter Anthony et al., 2014) based in parts on NSF and NASA-funded work by Dr. Grosse at the GIPL.

Dr. Reginald Muskett continued investigations into the changes of the permafrost regions of the Northern Hemisphere and Alaska using methods and techniques of Space Geodesy. This year Reginald had three publications (http://permafrost.gi.alaska.edu/user/8/biblio). Dr. Muskett convened and chaired permafrost science sessions at the EGU General Assembly; the AGU Fall Meeting; and the Open Session on Permafrost at the 4th EUCOP. Dr. Muskett participated in a workshop organized by the Jet Propulsion Laboratory for a newly proposed satellite dual-band radar mission of NASA and the Indian Space Research Organization at the USGS Headquarters in Reston, Virginia. He also participated in a workshop/meeting organized by the USGS Alaska Climate Science Center with partner Alaska and Canada-based Landscape Conservation Cooperative Services held in Anchorage, Alaska.

Dr. Alexander Kholodov continued his permafrost coring efforts for cryostratigraphic, paleoenvironmental, and biogeochemical research. As a part of collaboration with Argonne National Laboratory, US Depart of Energy three boreholes (ranging from 5-11 m) were drilled in Interior Alaska. Also, two 15 meter deep boreholes were drilled at the lower Kolyma River area as part of the NSF funded "The Polaris" project. A number of laboratory analyses including soil physical properties, palynology, estimation of carbon pools, composition of organic matter, enzyme activity, and microbiology are being conducted on samples from the foregoing permafrost cores. As part of the NSF AON project, boreholes from 9 to 15 m depth were instrumented for continuous temperature measurements. Dr. Kholodov was awarded funding from NSF for a new collaborative project entitled "Vegetation and ecosystem impacts on permafrost vulnerability"; the project starts in January 2015.

Dr. Dmitry Nicolsky worked on ground temperature modeling in the Northern Hemisphere using a historical climate forcing CRU3.1 for the retrospective (1960-2009) and CCSM RCP 4.5/8.5 scenarios for the future (2009-2300) analysis of permafrost dynamics. Dr. Nicolsky also investigates effects of uncertainties in parameterization of the ground properties and climate forcing on results of the numerical simulations.

Dr. Santosh Panda continued working on a National Park Service (NPS) funded permafrost modeling project focused on developing high-resolution (30 m) maps of near-surface permafrost temperature and active-layer thickness for national parks in Alaska. Products and reports of the permafrost modeling in *Denali* and *Wrangell-St. Elias National Park and Preserve* are now available on both the GIPL and NPS websites (https://irma.nps.gov/App/). High-resolution permafrost modeling in the five Arctic national parks is currently ongoing. The modeling products and reports of Arctic parks will be available by spring 2015. Dr. Panda started a new collaborative project entitled "*Hot Times in Cold Places: The Hidden World of Permafrost*" funded by NSF. The project focusses on improving the delivery and effectiveness of STEM learning related to climate change.

PhD student Prajna Regmi Lindgren performed remote sensing analysis of thermokarst lake methane ebullition from Fairbanks lakes within a NASA funded project on North American lake methane emissions. She also continued working on lake mapping and change analysis for the Western Alaska LCC region. In April, she attended Western Alaska Interdisciplinary Science Conference to present her work on lake mapping using object-oriented classification techniques. She presented her results from the remote sensing analysis of methane ebullition bubbles at the 4th EUCOP in June.

Louise Farquharson, PhD student in Quaternary geology, presented new data from her National Park Service funded project on modern coastal dynamics in NW Alaska at the 4th EUCOP and for the National Park Service Climate Change webinar series. During July 2014, Louise conducted canoe based field work along the upper Noatak River, collecting hundreds of soil samples in order to answer the question: how does ice wedge polygon development affect century to millennial scale soil organic carbon accumulation? She currently has an article in review at Quaternary Science Reviews "Facies analysis of Yedoma thermokarst lakes on the northern Seward Peninsula, Alaska" and is currently preparing the manuscript "Spatial distribution of major thermokarst landforms across Arctic Alaska" which will describe results of thermokarst landform mapping at sites aligned with the NSF AON funded lake observation network CALON. This mapping effort was done in collaboration with the Alaska Thermokarst Model extension of the Integrated Ecosystem Model for Alaska project (jointly funded by the Arctic Landscape Conservation Cooperative and the USGS Alaska Climate Science Center).

Viacheslav Garayshin joined the GIPL team as a new PhD student under Dr. Nicolsky. His work explores the influence of climate and ground physical properties on ice wedge destabilization with an ultimate goal of improving the understanding of ice wedge degradation on the North Slope of Alaska.

Visit Geophysical Institute Permafrost Laboratory website for further details on the current and past projects, data, reports, publications of all GIPL members, and latest permafrost news, www.permafrostwatch.org. **GIPL Team**: Vladimir Romanovsky, Sergey Marchenko, Guido Grosse, Alexander Kholodov, Reginald Muskett, Dmitry Nicolsky, William Cable, Santosh Panda, Prajna Regmi Lindgren, Louise Farquharson and Viacheslav Garayshin.

George Washington University (GWU): Permafrost research at GWU is focused on three thematic areas: long-term monitoring and dynamics of the active-layer and near-surface permafrost (CALM), interactions between permafrost and hydrologic regimes in the Russian Arctic, and socio-economic development in Russian permafrost regions.

Field activities for the Circumpolar Active Layer Monitoring (CALM) project were conducted in Alaska and Russia during the summer of 2014 under the newly established CALM IV program. CALM IV is funded by the U.S. National Science Foundation's Arctic Observing Network program for the 2014-2019 period, and provides support for field operations at permafrost observatories in northern and western Alaska and at numerous Russian sites. The project is headquartered at GWU, with subcontracts to the University of Montana and Northern Michigan University. The 2014 Alaska field team consisted of Nikolay Shiklomanov and Dmitry Streletskiy (GWU), Anna Klene (University of Montana), Fritz Nelson (Northern Michigan University and Michigan State University), and four GWU students (S. Dahodwala, E. Dolfi, K. Nyland, and E. Watson). Annual active-layer and 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 Seward Peninsula. Ground-subsidence monitoring by means of differential GPS was conducted at several sites. All data generated under CALM's programs are available through the CALM webpage <www.gwu.edu/~calm>.

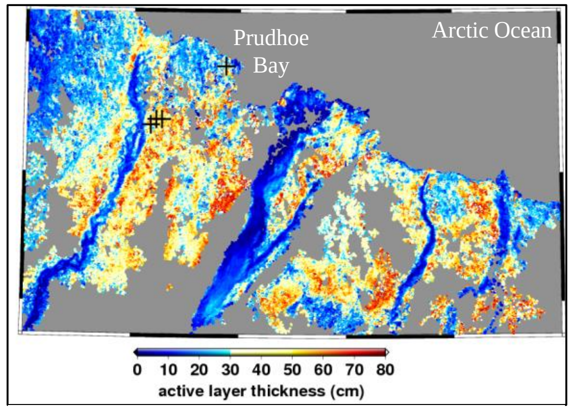
We continue to develop methodology for quantitative evaluation of socio-economic impacts on permafrost degradation. Over the past several years we have broadened this research by including political, economic, and demographic issues related to development in Russian permafrost regions. This research effort is collaborative between the GWU Geography department, the GWU Institute for European, Russian and Eurasian Studies (IERES), and the University of Tromso, Norway.

Dmitry Streletskiy spent much of summer 2014 in central Siberia, where GWU geography masters students Kelsey Nyland and Stephen Ross, and undergraduate Jennifer Young joined twelve students from Russia, Norway, Germany, and the UK on a multidisciplinary Arctic study of the various impacts of climate change on social and environmental systems affected by permafrost. The field course has been organized by Dmitry Streletskiy and Valery Grebenets (Moscow State University) for several years, with help from the Barents Institute (Norway) and several private sponsors. This summer, the course focused on the Yenisei North. Investigations were concentrated in Igarka in the forest-tundra transition zone on discontinuous permafrost, and in Norilsk in the continuous permafrost zone dominated by tundra landscapes. In Igarka, students were involved in field work conducted by the Igarka Geocryology Lab under a joint UNH - GWU collaborative research project examining the role of various hydrological inputs to river watersheds. In Norilsk, students were exposed to problems of development and construction on permafrost and helped to collect field data on permafrost temperature and building deformation under the *Arctic Urban Sustainability in Russia* project. At both locations, students visited CALM sites to measure active-layer thickness. More information on these activities is available at: http://barentsobserver.com/en/society/2014/07/permafrost-thaw-cracks-urban-infrastructure-students-dig-15-07

Senior CALM investigators and graduate students made presentations at several 2014 conferences, including the annual meetings of the Association of American Geographers (Tampa) and the American Geophysical Union (San Francisco), the Fourth European Conference on Permafrost (Évora), the European Geophysical Union (Vienna), the DUE Permafrost workshop (Frascati), and the Arctic Urban Sustainability Conference (St. Petersburg). Fritz Nelson delivered the keynote conference address at the 2014 meeting of the Michigan Academy of Science, Arts and Letters.

Kristen Pyne completed a master's degree in geography at GWU with a thesis entitled *Relation between Snow and Winter Soil-Surface Temperatures in Tundra Landscapes: Results of Observations in Northern Alaska*. At UM, Katrina Keleher completed a senior undergraduate thesis entitled *Comparison of instrumentation to measure air and soil temperatures in northern Alaska*.

National Snow and Ice Data Center (NSIDC) will integrate existing borehole data into the Global Terrestrial Permafrost Network (GTN-P), doubling the number of sites. The main objectives of this work are 1) extract and integrate select NSIDC Frozen Ground Data Center (FGDC) and Advanced Cooperative Arctic Data and Information Service (ACADIS) permafrost data holdings into the GTN-P data system; 2) support semantic infrastructure by extending the GTN-P domain ontology to include broader permafrost and climate modeling concepts and terms; 3) close the interoperability loop by integrating GTN-P metadata and systems with the distributed Arctic Data Explorer search portal and Arctic Observing Viewer; and 4) improve data usability through visualization services that quickly produce customized maps at multiple spatial scales. The team is funded by National Science Foundation (NSF) and consists of Lynn Yarmey, Elchin Jafarov, Kevin Schaefer and Antonia Rosati from NSIDC in collaboration with the Iceland-based Arctic Portal team developing the GTN-P data system.



1992-2000 average Remotely Sensed Active 1992-2000 average Remotely Sensed Active Layer Thickness (ReSALT) for the Prudhoe Bay area on the North Slope of Alaska derived from the European Remote-Sensing Satellite (Liu et al., 2012).

The Remotely Sensed Active Layer Thickness (ReSALT) product uses the Interferometric Synthetic Aperture Radar technique to measure seasonal surface subsidence and infer ALT in several regions in Alaska (Figure 1). Measuring ALT using remote sensing would provide valuable information over regional spatial scales to complement the *in situ* measurements at CALM sites. The team consists of Tingjun Zhang, Kevin Schaefer, and Elchin Jafarov at NSIDC, Albert Chen and Howard Zebker at Stanford University, Andrew Parsekian at the University of Wyoming, and Lin Lui at the Chinese University of Hong Kong. ALT remote sensing techniques typically use empirical relationships between probe measurements and a physical attribute applied to remotely sensed data of that attribute to extrapolate ALT over a larger area. Our results indicate remote sensing techniques based on InSAR could be an effective way to measure and monitor ALT.

Schur Lab, at Ecosystem Dynamics Research Lab, University of Florida and Center for Ecosystem Science and Society (ECOSS), Northern Arizona University: Carbon in Permafrost Experimental Heating Research (CiPEHR) at Eight Mile Lake, Healy AK. Understanding arctic carbon (C) dynamics is crucial for predicting regional and global ecosystem responses to climate change. CiPEHR is designed to investigate the impact of thawing permafrost and warmer summer air temperatures on moist acidic tundra. Located in a discontinuous permafrost zone at the southern extent of arctic tundra, this region may foreshadow C cycle vulnerabilities and instabilities in a changing climate. Since 2008, the rate of permafrost thaw has been promoted with snow fences, which accumulate snow and insulate the ground in winter while summer air temperatures have been increased using open top chambers (OTCs).

The insulating layer of snow that builds up in the winter must be shoveled off in the spring to prevent phonological delays and increased water input.

Carbon exchange is monitored during the growing season with automated chambers, and 13C and 14C are used to partition respiration fluxes into contributions from autotrophic, heterotrophic, young and old soil C. In order to better understand the mechanisms responsible for changes in C dynamics we also measure thaw depth, water table depth, plant growth and community composition, NDVI, plant phenology, plant tissue nitrogen (N) content and soil N cycling.

A water table manipulation plot from DryPEHR

So far we have found that plant growth increased vigorously, initially only in response to air warming. After 3 years of soil warming a progressively deeper active layer and higher N availability stimulated plant growth more than elevated air temperatures. Although soil respiration also increased in response to thaw, the growing season remained a C sink because plant C uptake exceeded respiration losses. However, winter C losses estimated using soil temperature driven models suggest that on an annual basis the degradation of permafrost may have pushed the system from a C sink to a C source. This result supports other evidence that the arctic is increasingly an annual C source.

A view of experimental plots, OTCs and C flux autochambers

Large uncertainties still remain, however, particularly about the influence of winter respiration on the annual C balance, interactions between soil C and N cycling, the importance of autotrophic vs. heterotrophic contributions to respiration fluxes, and the influence of water table changes.

In 2011 CiPEHR was expanded to include DryPEHR, a water-table manipulation experiment, DryPEHR investigates CO2 and CH4 fluxes given the additional complexity that permafrost thaw can cause either surface subsidence and water-saturated soil or sudden drainage. Results from this study are forth coming.

We have manuscripts in review. One addresses improvements to our winter C model; a separate manuscript investigates how permafrost thaw affects the heterotrophic respiration of old soil C.

Measuring δ13C of ecosystem respiration using the Picarro G2121- i

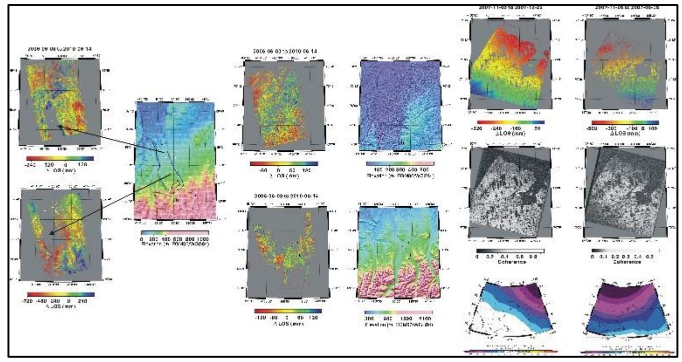
Ongoing soil incubation studies in the lab allow us to examine the decomposition dynamics of labile and recalcitrant C pools within active layer and permafrost soils. One study in progress looks at N dynamics throughout the soil profile while another explores the role of priming during the decomposition of the permafrost soil C pools. This summer we worked hard to erect a windmill to power our Eddy tower at the nearby Eight Mile Lake site to increase our sampling during dark winters. We conducted a pilot study using the Picarro G2121-i analyzer and in 2015 we will launch an extended sampling campaign to capture high-frequency seasonal 13C dynamics of ecosystem respiration.

Individual Member Activities:

Kristine de Leon (Ph.D. Student, Department of Soil, Water, and Environmental Sciences, University of Arizona): Before starting my first year in graduate school, I spent the summer in the High Arctic in Svalbard, Norway to study Arctic Microbiology at the University Centre at Svalbard. There, I gained useful theoretical and practical field knowledge on Arctic microbiology and ecosystems that I will apply to my graduate research. My graduate work focuses on utilizing metagenomic and metaproteomic methods to study carbon cycling in a permafrost thaw gradient in Stordalen Mire, Abisko, Sweden. I am interested in permafrost thaw, because in many parts of the Arctic, permafrost thaw due to rising temperatures results in the conversion of dry tundra to wetland bog and fen ecosystems. Such increases in anaerobic environments may have substantial feedbacks to the rate of climate change through the increased production of CH_4, a greenhouse gas an order of magnitude more potent than the CO_2 respired from aerobic soils. However, the controls on these decomposition processes are complex and include changes in hydrology, temperature, pH, plant community influences on the soil, and microbial community composition. As part of a large DOE-funded, international collaboration, we synthesize information gained from isotope biogeochemistry, organic carbon chemistry, geology, microbiology, and ecosystem science in order to characterize the controls on carbon cycling in a thawing permafrost peatland. The resulting picture of the ecosystem transition will allow us to better understand the potential feedbacks of Arctic permafrost thaw on the global climate system.

Daniel Fortier: In collaboration with Prof. Yuri Shur and Prof. Mikhail Kanevskiy of the University of Alaska Fairbanks, Prof. Daniel Fortier and M. Sc. student Lyna Lapointe-Elmrabti, pursued their work on yedoma deposits of the Alaska-Yukon sector of Beringia. Using pollen analysis and transfer function, we study changes in ecological conditions and climate during the Pleistocene/Holocene and evaluate paleo-environmental gradients between Northern Alaska and southern Yukon.

Reginald Muskett continues research investigations into the changes of the permafrost regions of the Northern Hemisphere with measurements from the Gravity Recovery and Climate Experiment (GRACE), the Phase Array L-band Synthetic Aperture Radar (PALSAR) and the Moderate Resolution Imaging Spectroradiometer (MODIS). This year he published two more papers on Arctic land-surface temperature nighttime and diurnal trends (Muskett, 2014a and b) in addition to the paper on the Lena Delta and Laptev Sea using measurements from the Ice, Cloud and land Elevation Satellite (ICESat), which was reported earlier (2014c), and is preparing a new paper on active layer soil moisture measurements and satellite-algorithm retrievals. He is also working with other members of the lab on new projects in Alaska's permafrost regions and is preparing project proposals to NASA as well as joint-member proposals to NSF for 2015.



In 2014 Reginald continued and expanded his activity of convening and chairing permafrost science sessions at the European Geoscience Union (EGU) General Assembly, Vienna, Austria, and elsewhere internationally. At the EGU Reginald co-convened and co-shared again the session on "Assessing the effects of global warming on permafrost degradation." Reginald was the convener and chair of the Open Session on Permafrost at the 4th European Conference on Permafrost held in Évora, Portugal during June 2014. He also submitted a permafrost session proposal to the American Geophysical Union Fall Meeting Near Surface Geophysics Focus Group committee. After collection of abstracts and negotiations with another interested group the combined session, "Applications of Near-Surface Geophysics in Cold Regions" was accepted for the AGU Fall Meeting in San Francisco during which he will be Chair and co-convener of the Oral and Poster sessions.

This year Reginald participated in the Jet Propulsion Laboratory - NASA workshop held at the USGS Headquarters, Reston, Virginia, on the new proposed satellite dual-band radar mission, NISAR, a joint mission proposed by NASA - Indian Space Research Organization. Other interested US Federal Agencies included USGS, Dept. of Navy, NOAA and DHS. He also attended the USGS Alaska Climate Science Center - Alaska and Canada-based Landscape Conservation Cooperative Services workshop/meeting in Anchorage, Alaska.

Muskett, R. (2014a) "MODIS-Derived Nighttime Arctic Land-Surface Temperature Nascent Trends and Non-Stationary Changes," American Journal of Climate Change, Vol. 3, pp. 169-177. doi: 10.4236/ajcc.2014.32016.

Muskett, R. (2014b) "Arctic Diurnal Land-Surface Temperature Range Changes Derived by NASA MODIS-Terra and -Aqua 2000 through 2012," Atmospheric and Climate Sciences, Vol. 4, pp. 231-240. doi: 10.4236/acs.2014.42026.

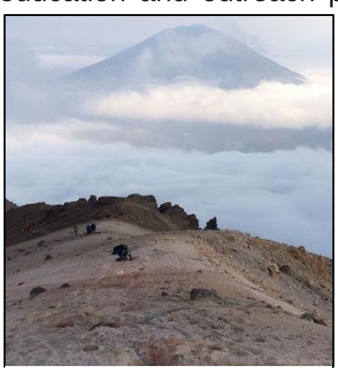
Muskett, R. (2014c) "ICESat-Derived Elevation Changes on the Lena Delta and Laptev Sea, Siberia," Open Journal of Modern Hydrology, Vol. 4, No. 1, pp. 1-9. doi: 10.4236/ojmh.2014.41001.

Dave Swanson (National Park Service, Fairbanks, AK) completed a map of active-layer detachments (ALD) and retrogressive thaw slumps (RTS) in the 5 National Parks of northern Alaska based on high-resolution satellite imagery. There were over 2000 ALD, exposing about 300 ha of bare soil, and 700 RTS exposing about 235 ha of bare soil. Most of the ALD appear to have formed in the early- to mid-2000 decade and are now re-vegetating, while many of the RTS are still active. The NPS is monitoring the growth of selected RTS with 3D models constructed from 35 mm digital aerial photographs. For links to NPS reports on these and related topics see http://science.nature.nps.gov/im/units/arcn/vitalsign.cfm?vsid=9 and https://irma.nps.gov/App/Reference/Search?collectionId=618

Gareth (Gary) Trubl (Ph.D. Student, Department of Soil, Water, and Environmental Sciences, University of Arizona): The microbial release of CO_2 and CH_4 from thawing permafrost is a major positive feedback that perpetuates permafrost thaw. Once permafrost has begun to thaw the juicy organic carbon becomes available for microbes. Viruses are the ultimate control on microbial populations and their function. Viruses are the most abundant biological entities on Earth and their impact on carbon cycling in permafrost habitats is poorly understood, because they have never been researched in permafrost! Viruses of microbes (i.e. phages) play central roles in C cycling in the oceans, through cellular lysis (phage drive the largest ocean C flux about 150 Gt yr^{-1}, dwarfing all others by >5-fold), production of associated DOC, as well as transport and expression during infection (10^{29} transduction events day^{-1}). Preliminary data from our lab shows phage are at least 100x more abundant in our field site (Stordalen mire, Abisko, Sweden), then in the oceans and therefore may play a larger role in carbon and nutrient cycling. Not only is this work novel, but any results can further the >100 years research that has been performed at the mire. Currently we are working on a model for the site to determine the overall impact of permafrost thaw, potential habitat transformations, and their effect on climate change. This work is key in making this model accurate. To address the potential role of phage in C cycling in these dynamic systems, we are examining phage from an arctic permafrost thaw gradient in northern Sweden. We have developed a protocol for successfully extracting phage from peat soils and are quantifying phage through epifluorescence microscopy and quantitative transmission electron microscopy analyses. Along with this we are constructing the first permafrost viromes for identification and to understand their role in this critical habitat. US Department of Energy Office of Biological and Environmental Research (DE-SC0004632 and DE-SC0010580)

Kenji Yoshikawa (University of Alaska Fairbanks) and Russian colleagues visiting indigenous communities around the Eastern Siberia including most of Sakha Republic (Yakutia), Baikal, Chukotka and Kamchatka for establishing community based permafrost /active layer network, which was covered 90 communities in Russia today. Data archived book "Permafrost in Our Time" published using our monitoring sites and data nearly 300 communities mainly in North America and will republish Russian version next a few years. Electric version is available at http://issuu.com/permafrostbook/docs/piots. The hard copy book was delivered to the communities for education and outreach purpose all of the Alaskan villages and some in others. For leading of the Thematic Network on Permafrost at the University of the Arctic, we keep updating IPA International University Courses on Permafrost (http://ipa.arcticportal.org/resources/courses-iucp.html) and operated the International Permafrost Summer Course with Hanne Christiansen at UNIS(more detail; see Education and outreach activities on this issue of Frozen Ground)(https://www.facebook.com/TNPermafrost).

Permafrost education open house at Yakut



DC resistivity survey at Chachani (5350m)

For mountain permafrost, we did have a temperature monitoring boreholes in Chachani (6057m), Coropuna (6425m) Peru, Kilimanjaro (5895m) Tanzania, Iztaccihuatl (5230m) Mexico, Mauna Kea (4205m) Hawaii, USA and Denali (Mt. McKinley) (6168m) today including satellite based data logging system (https://www.facebook.com/Kilimanjaro2012). We had great success to operate DC resistivity survey at Peruvian Andes and Hawaii.

Denali (Mt. McKinley) monitoring site

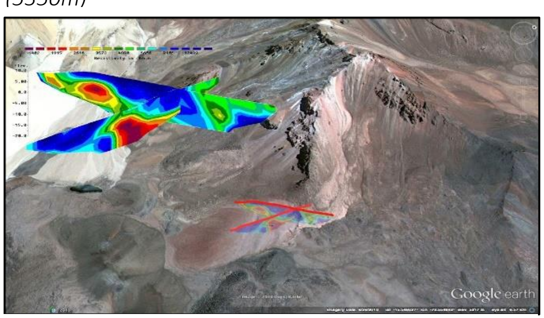
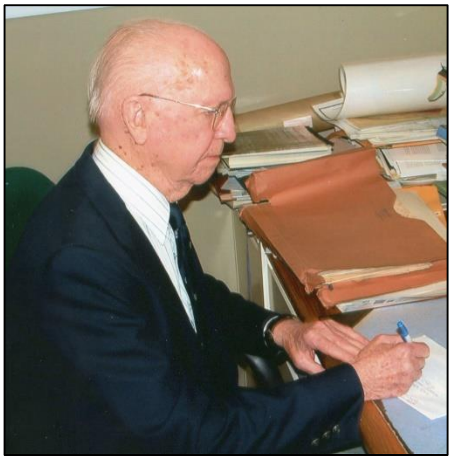


Image of DC resistivity survey results at Coropuna site, Peruvian Andes

Deaths:



We regret to announce the death on October 2, 2014 of Professor Emeritus **John C.F. Tedrow**, Rutgers University, at age 97. John was a pioneer in polar soil science, an advisor to more than 20 doctoral and masters students, long-time editor of the journal *Soil Science*, and author of over 100 publications. His textbook *Soils of the Polar Landscapes* is a lasting tribute to his knowledge and scholarship. A detailed obituary appears in the December 2014 issue of *Arctic*.

Compiled by: Molly McGraw, Secretary US Permafrost Association
(molly.mcgraw@selu.edu)