UNITED STATES OF AMERICA

US PERMAFROST ASSOCIATION

The annual meeting of the US Permafrost Association (USPA) Board of Directors and a general member meeting was held on December 12 at the 2017 Fall Meeting of the American Geophysical Union in New Orleans, Louisiana. Current USPA membership includes: 20 student members, 45 regular members, 22 corporate/non-profits/lifetime members, for a total of 99 members (including several non-US members). The annual meeting convened at the Howling Wolf and was attended by approximately 150 members and their guests.

Anna Liljedahl became the new President of the USPA. Dmitry Streletsky was elected President-Elect, John Thornley elected Board Member-at-Large, and Molly McGraw re-elected Secretary.

We regret to announce the unexpected death of Andrew Slater in September 2017. Drew was a research scientist at the National Snow & Ice Data Center (NSIDC) in Boulder, CO. The USPA received a generous donation from Drew's family to establish the Andrew Slater Memorial Scholarship for early career Arctic researchers. At the USPA General Meeting, Heidi Rodenhizer (Northern Arizona University) was the first recipient of the scholarship.

The U.S. Permafrost Association, together with the American Geosciences Institute (AGI), provides a Permafrost Monthly Alerts (PMA) on USPA web site (http://www.uspermafrost.org/monthly-alerts.shtml). The AGI GeoRef service regularly scans the contents of over 3500 journals in 40 languages from the global geosciences literature, comprised of approximately 345 different sources. In addition to journals, special publications such as papers in proceedings and hard-to-find publications are provided. Where available, a direct link to the publication is included in the PMA. In 2017 there were approximately 1500 accessions of which 1000 were conference abstracts including all XI ICOP abstracts. See our website for current and past activities: http://www.uspermafrost.org/.

American Society of Civil Engineers

ASCE has reorganized the former Technical Council on Cold Regions Engineering (TCCRE) into the new Cold Regions Engineering Division (CRED). CRED has five technical committees that assess and report on effects of cold regions environments upon engineering design, construction, and operations. Additionally, the Publication Committee of CRED is responsible for editing the peer-reviewed Journal of Cold Regions Engineering published by ASCE. The quarterly Journal publishes practice- and research-oriented articles from any area of civil engineering that is substantially related to cold regions. Topics include permafrost and seasonal frost, ice engineering, construction, environmental quality, snow and ice control, and cold regions materials. The Journal currently publishes 25 to 30 refereed papers per year.

In 2017, CRED was one of the sponsors of the Congress on Technical Advancement held in Duluth, MN on 10-13 September. The theme of the congress was Superior Performance in a Changing Climate and it brought together engineers from the Aerospace Division, Committee on Adaptation to a Changing Climate, CRED, Construction Institute, Energy Division, Forensic Engineering Division and the Infrastructure Resilience Division. Permafrost was a common topic in many of the presentations. A published proceedings was produced and is available through ASCE Publications. The ASCE Cold Regions Engineering Awards were presented at a conference luncheon with Douglas J. Goering receiving the Harold R. Peyton Award for Cold Regions Engineering and Howard P. Thomas receiving the Can – Am Civil Engineering Amity Award. All of the Committees of CRED met at the Conference and the first meeting of the Committee charged with updating the ASCE Standard on Frost Protected Shallow Foundations also occurred at the Conference.

The Environmental and Public Health Engineering Committee of CRED is currently updating the Cold Regions Utilities Monograph that's widely used as a reference by many engineers working in areas of permafrost. This document is scheduled to be published in late 2018.

ASCE is also co-sponsoring the upcoming 2018 Arctic Technology Conference in Houston, TX on November 5-7 to discuss the latest technologies, responsibilities, and practices for responsible exploration and production in the Arctic where permafrost can be a major challenge. The next ASCE International Conference on Cold Regions Engineering is tentatively scheduled for 2019 in Quebec City.

International Association for Engineering Geology and the Environment (IAFG)

IAEG Commission 21: Engineering Geology of Permafrost Regions has been inactive for several years and is currently being re-invigorated. Ed Yarmak from the USA has assumed Commission chair and Dmitry Sergeev from Russia continues as Commission secretary. At the IAEG Council Meeting in Kathmandu on November 26, 2017, the call for new membership of the committee was initiated. The

committee is preparing to produce a white paper to help small communities assess when they need to initiate engineering studies to maintain existing infrastructure on permafrost as the climate warms. The cost of prevention and remediation is generally small compared to the cost of replacement.

Institution Member Activities:

U.S. Army Cold Regions Research and Engineering Laboratory (CRREL)

The U.S. Army Cold Regions Research and Engineering Laboratory reports on a variety of active research and engineering projects. Extensive excavations and upgraded facilities are ongoing for the Permafrost Tunnel near Fairbanks in 2018. The ultimate goal is a three dimensional test bed for geophysical and remote sensed measurements of massive ice features. For the past few years CRREL has conducted a successful permafrost thawing experiment at the Fairbanks Permafrost Experiment Station in collaboration with Lawrence Berkeley National Laboratory where fiber optic cables have been demonstrated to serve as an early detection system for permafrost degradation. Ongoing engineering design and siting for infrastructure at Thule, Greenland has included geological, geotechnical, design and remediation work. Supporting Moose Creek Dam Flood Control Project upgrades, CRREL conducted extensive geophysics to delineate frozen vs thawed zones and identify changes in soil class. Supporting NSF's new development at McMurdo Station Antarctica, CRREL provided review and recommendation of site conditions for infrastructure foundations to be placed on frozen volcanic bedrock. Supporting the Army High Altitude Research Facility upgrade on Pikes Peak Colorado in conjunction with Colorado Springs Colorado, CRREL provided review and recommendation of the site conditions and proposed foundation for new infrastructure to be placed on ice-rich decomposed bedrock. A variety of ongoing and new projects are focused on identifying thermokarst risks and studying habitat-hydrology-permafrost thaw linkages across interior Alaska.

Geophysical Institute Permafrost Laboratory, University of Alaska Fairbanks

The Geophysical Institute Permafrost Laboratory (GIPL) 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 “Development of sustainable observations of thermal state of permafrost in North America and Russia: The U.S. contribution to the GTNP”. As part of “Use of AIEM permafrost module output to assess the permafrost changes in the 21st century” project the GIPL team modeled the permafrost dynamics of North Slope of Alaska through 2100 using Ecotype approach. As part of “Community based permafrost and climate monitoring in rural Alaska” the GIPL team established 18 new ground temperature monitoring stations in the Upper Kuskokwim region 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, Dmitry Nicolsky, Alexander Kholodov, Reginald Muskett, William Cable, Santosh Panda, Louise Farquharson, Lily Cohen, and Kirill Dolgikh.

George Washington University

Professors Nikolay Shiklomanov and Dmitry Streletskiy continued to manage the long-term NSF-funded Circumpolar Active Layer Monitoring (CALM) Project. In August 2017, a group of GWU, Michigan State University (MSU), and University of Montana (UM) faculty and students continued field work in northern Alaska. This year’s team consisted of GWU undergrads, Patrick Huggins and Emily Evenden; UM graduate student, Brianna Rick; and MSU graduate students, Kelsey Nyland (GWU Alumna) and Clayton Queen.

In July 2017, Drs. Shiklomanov and Streletskiy, graduate student Luis Suter, and 8 undergraduate students participated in an international field course in Western Siberia. Funded through the Arctic Partnerships for International Research and Education (PIRE) grant, the group traveled from Moscow to field sites in Salekhard and Vorkuta.

2017 publications:

Streletsky, D.A., Shiklomanov, N.I., Little, J.D., Nelson, F.E., Brown, J., Nyland, K.E., and Klene, A.E. (2017). Thaw subsidence in undisturbed tundra landscapes, Barrow, Alaska, 1962-2015. *Permafrost and Periglacial Processes* 28(3): 566-572.

Michigan State University and Northern Michigan University

Michigan State University’s (MSU) permafrost group consists of Adjunct Professor Fritz Nelson, Ph.D. student Kelsey Nyland, and M.S. student Clayton Queen. The group is investigating periglacial landforms in the unglaciated uplands of interior and western Alaska. Our specific focus is the origin and age of cryoplanation terraces (CTs), a widespread but under-investigated class of landforms that occur in many parts of Beringia. Research activities include

spatial analysis at local and regional scales, relative age dating across terrace treads, investigating soil and sediment toposequences, evaluating geomorphometric parameters, and mapping geomorphic associations. Nyland and Nelson recently received an award from the U.S. National Science Foundation (NSF) to determine the age of CTs in Alaska's Yukon-Tanana Upland using cosmogenic dating, and to assess whether the features form synchronously with glacial intervals. Nyland and Queen have also received financial support for their work from the Arctic Institute of North America, the Geological Society of America, USPA, and various units at MSU. In July 2017 the group expanded the scope of their investigations into nivation processes at a high-elevation site near Atlin, British Columbia. This component of our work is carried out in association with the Juneau Icefield Research Program. The MSU group is also closely involved in the Circumpolar Active Layer Monitoring (CALM) program (see report from George Washington University). Our research under CALM is funded by NSF through a subaward to Northern Michigan University, where Nelson is a research associate. During 2017 the MSU group also made presentations at meetings of the American Association of Geographers, the Geological Society of America, and the American Geophysical Union.

2017 publications:

Brigham, L.W. and Nelson, F.E. (eds., 2017). Geographical Perspectives on the Arctic. Special issue of *Geographical Review* 107(1): 1-257.

Burn, C.R. and Nelson, F.E. (2017). In Memoriam: J. Ross Mackay, 1915-2014. *Annals of the American Association of American Geographers* 107(4): 998-1010.

Fagan, J.E. and Nelson, F.E. (2017). Sampling designs in the Circumpolar Active Layer Monitoring (CALM) program. *Permafrost and Periglacial Processes* 28(1): 42-51.

Nelson, F.E. and Nyland, K.E. (2017). Periglacial cirque analogs: regional trends of cryoplanation terrace elevation in eastern Beringia. *Geomorphology* 293: 305-317.

Nyland, K.E., Klene, A.E., Brown, J., Shiklomanov, N.I., Nelson, F.E., Streletskiy, D.E., and Yoshikawa, K. (2017). Traditional Iñupiat ice cellars (Siġ-uaq) in Barrow, Alaska: characteristics, temperature monitoring, and distribution. *Geographical Review* 107(1):143-158.

Streletsky, D.A., Shiklomanov, N.I., Little, J.D., Nelson, F.E., Brown, J., Nyland, K.E., and Klene, A.E. (2017). Thaw subsidence in undisturbed tundra landscapes, Barrow, Alaska, 1962-2015. *Permafrost and Periglacial Processes* 28(3): 566-572.

Marine Electromagnetics Lab, Scripps Institution of Oceanography

The Marine Electromagnetics Lab at Scripps Institution of Oceanography has developed a surface-towed electric dipole-dipole system capable of operating in shallow water and deployable from small boats. Our system uses electromagnetic energy from a modulated manmade source to interrogate the underlying resistivity structure of the seafloor. We used this system to map subsea ice-bonded permafrost on the Beaufort Shelf along 200~km of coastline, from Tigvariak Island to Harrison Bay. Research was conducted out of West Dock, North Slope, AK, on the R/V Ukpik over a total of 12 days.

Permafrost is resistive and was found to be anisotropic, likely due to interbedded layers of frozen and unfrozen sediment. Maps of depth to permafrost and its thickness were produced and results compared to borehole logs in the area. We observed elevated resistivity values offshore the Sagavanirktok River outflow, supporting the idea that fresh groundwater flow has a preserving effect on submerged permafrost. This system provides a cost effective method that could be used to further quantify permafrost extent, provide a baseline for measurements of future degradation, answer questions about the relationship between coastal erosion rates and offshore permafrost, and provide observational constraints on pore water salinity to aid in permafrost modeling studies.

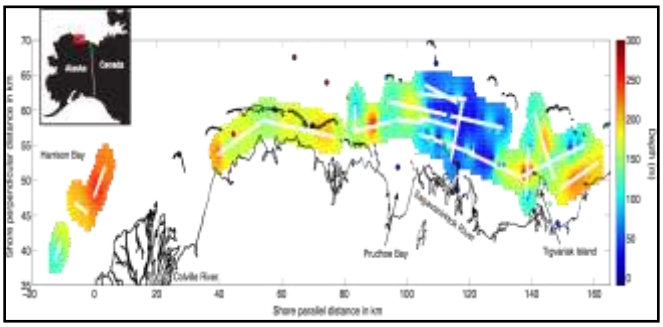

Figure 1: Map of depth to top of permafrost from electromagnetic inversion results. Depths to top of permafrost from boreholes in the area are plotted in circles.

Next-Generation Ecosystem Experiments (NGEE Arctic)

A Systems Approach to Understanding Methane Cycling in the Arctic: Throughout the Arctic, and around the world, scientists are working to understand and model methane emissions from carbon-rich permafrost ecosystems. The Next-Generation Ecosystem Experiments (NGEE Arctic) project is taking a systems approach to predicting carbon cycling in the Arctic, quantifying sources and sinks of methane in tundra ecosystems. Although the

importance of methane is widely acknowledged, its emission from thawing landscapes is highly uncertain. This uncertainly limits our predictive understanding of methane production and our ability to capture seasonal patterns of methane flux in models.

Since 2012, studies at field sites on Alaska's North Slope and the Seward Peninsula have assessed important microbial and geochemical controls on methane cycling in high-latitude ecosystems. Measurements from two atmospheric "flux" towers near Barrow, Alaska revealed large emissions of methane before spring snow melt. These pulses, observed previously but not understood, were linked to unique weather events where freezing rain on snow blocked methane emissions from underlying soils. This pulse is large enough to offset a significant fraction of the Arctic tundra carbon sink and raises questions about processes that may be missing from current models.

Knowledge derived from long-term monitoring and targeted field and laboratory investigations is being incorporated into the E3SM Earth system model being developed by the Department of Energy, Office of Science, Biological and Environmental Research (BER). NGEE Arctic is drawing upon expertise from across DOE, and academic, international, and Federal agencies. The project benefits from regional co-location of sites with the DOE Atmospheric Radiation Measurement program, the NSF National Ecological Observatory Network, and NOAA Climate Modeling and Diagnostic Laboratory, and NASA ABoVE airborne campaigns. Additional information and data products can be found at: http://ngee-arctic.ornl.gov/.

University of Montana

The University of Montana continued to be active in permafrost research in several departments. Anna Klene continued as a co-PI of the CALM IV project concerned with northern and western Alaska, and as co-Chair of the Education & Outreach Committee of the IPA. MS student Brianna Rick participated in CALM's northern Alaska field season, conducted her thesis research, and was awarded an NSF Graduate Research Fellowship to continue on for a PhD. New MS student Ryan Rock joined the group to work on rock glaciers in the northern Rocky Mountains.

John Kimble and the Numerical Terradynamic Simulation Group continued their work on carbon cycle dynamics, surface hydrology, and changes in permafrost landscapes across Arctic-Boreal regions among other projects. Jennifer Watts is now looking at primary environmental conditions regulating the magnitude of soil CO2 released from permafrost affected soils during winter months. In addition, she and UM undergraduate Stephen Shirley, participated in fieldwork at Ivotuk on the North Slope of Alaska, installing new soil moisture and soil temperature sensors. See Research Gate for copies of recent publications.

Individual Member Activities:

Our members were busy this year. USPA Board Member Mark Demitroff, Stockton University, continues work with Franklin & Marshall College on thermal-contraction polygons and periglacial features in Pennsylvania; and has in press an article on the environmental dynamics of railroad-era ethnic settlement as linked to the Pleistocene "badlands" topography of the Pinelands National Reserve.

Molly McGraw, Jerry Brown, and Fritz Nelson chaired three sessions at the 2017 Annual American Association of Geographers (AAG) meeting honoring the late H. Jesse Walker. Walker was a renowned Arctic researcher who specialized in coastal and fluvial geomorphology.

Reginald Muskett, Ph.D., Research Associate, Geophysical Institute Permafrost Laboratory, continues investigations into the changes of the permafrost regions of the Northern Hemisphere. Measurements include the joint mission NASA-DLR Gravity Recovery and Climate Experiment (GRACE), the JAXA Advanced Land Observing Satellite 2 (ALOS2) Phased Array L-band Synthetic Aperture Radar 2 (PALSAR2) and the Global Navigation Satellite Systems (GNSS) coordinated with the International Terrestrial Reference Frame. In computational-engineering adventures all the parts have arrived for a new High Performance Computational Server that Reginald will be assembling and testing in the new year. Thanks to research collaborations with NASA-ABoVE, NGEE-Arctic, USGS Climate Science Center, Go Iwhana, Dmitry Nicolsky and Vladimir Romanovsky.

2017 Publications:

Muskett, R.R. (2017) L-Band InSAR Penetration Depth Experiment, North Slope Alaska. *Journal of Geoscience and Environment Protection*, 5, 14-30. DOI: 10.4236/gep.2017.53002.

D. J. Nicolsky, D.J., Romanovsky, V.E., Panda, S.K., Marchenko, S.S., Muskett, R.R. (2017), Applicability of the ecosystem type approach to model permafrost dynamics across the Alaska North Slope. *Journal of Geophysical Research Earth Surface*, 122 (1), DOI: 10.1002/2016JF003852.

In Memoriam:

Michael C. Metz, Consulting Engineer
Edward J Chamberlain, Jr., USA CRREL

Complied by: Molly McGraw, Secretary, US Permafrost Association (mmcgraw@selu.edu)