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Frozen Ground

THE NEWS BULLETIN OF THE
INTERNATIONAL PERMAFROST ASSOCIATION
WWW.PERMAFROST.ORG

Words from the President

BY HANNE H. CHRISTIANSEN, THE
UNIVERSITY CENTRE IN SVALBARD,
NORWAY

In 2019, the IPA held the first Regional Conference on Permafrost (RCOP) in the Southern Hemisphere: the 1st Southern Hemisphere Conference on Permafrost, SouthCOP, in New Zealand. It was a great pleasure and honor to open this conference, and to participate in and experience the permafrost activities presented. The conference offered an extensive round-tour excursion of the Southern Island through pre- and post-conference field trips, allowing participants to learn about landscape development, cold climatic environments and permafrost in New Zealand. We were 8 participants completing the full round tour with excellent Kiwi scientific guides. With this, the IPA has launched a new concept of providing an opportunity to not only travel to a regional conference, but also to further educate participants on the regional permafrost-related



Sorted stripes at 1580 m a.s.l. on Robert Ridge, Nelson Lakes, the New Zealand Alps, Dec. 2019.

conditions. During SouthCOP in New Zealand, organizers of a potential 2nd SouthCOP in South America met and discussed hosting a regional conference, including a round-tour through different areas in South America. Many thanks to the main SouthCOP organizer, Megan Balks, for making all this happen.

During 2019, the IPA Executive Committee (EC) has worked to revise the IPA Strategy Plan. A full-day physical meeting, hosted at the University of Zurich in Switzerland in June, was an important part of this work. The EC is therefore pleased to

present the revised IPA Strategy Plan 2020-2028 to the IPA Council for approval at the June meeting this year.

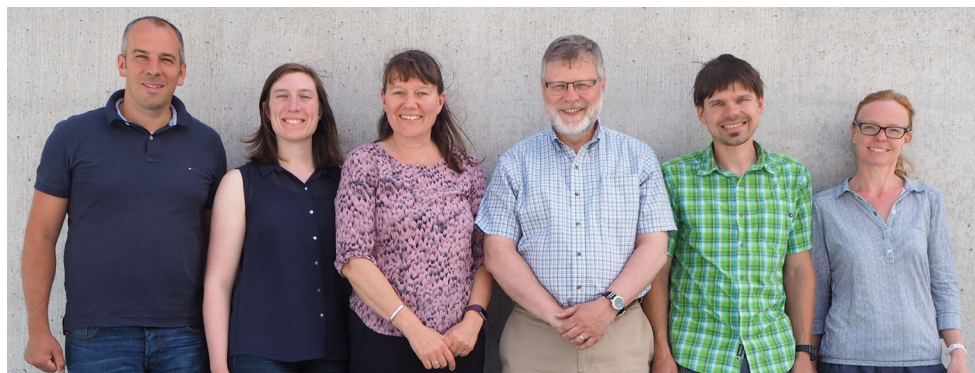
Now in spring 2020, we unfortunately know that the 12th International Conference on Permafrost, ICOP 2020, will not be held as planned in June this year in Lanzhou, China, due to the outbreak of coronavirus. This is an unprecedented situation. The IPA EC decided to keep up as much of the organization's activities as possible without meeting physically, and therefore the Council will meet online for the first time on 22 and 23 June to deal with the main

activities of the association. The IPA EC also held an investigation into the possibilities for postponing this conference. The best solution identified is to postpone the 12th ICOP to 2022 and for it to still be held in China. Presently, the Chinese ICOP organizers are looking into this possibility, and we understand that this will require extra efforts; however, the IPA EC is looking forward to hav-

ing this conference in China. For this to be possible, the RCOP planned in Spain in 2022 has to be moved. The Spanish organizers have very nicely been able to postpone this conference to 2023. This solution will allow the RCOP planned for Boulder, CO, USA in 2021, which has been accepted by Council, to still take place. This conference is already advanced in its planning and is co-organized with the biennial meeting of the Cold Regions Engineering Division

of the American Society of Civil Engineers. Once the solution is final, the Council will vote for the association to accept these major changes in conference timing.

As there will be no IPA conference in 2020, I take this opportunity to express my gratitude to the IPA for allowing me to have the responsibility for the association during the last four years as President. It has been a great pleasure and good challenge to be responsible for developing the IPA. I have now been involved in the leadership of the association for more than 20 years, first in the IPA Secretariat, then as EC member, Vice President and President. It is therefore time for new hands to take over the leadership from June this year. I am of course proud of having been the first female President of the IPA, and am expecting the IPA to aim for more to come in the future.



Participants of the IPA EC strategy meeting in Zurich: Michael Krautblatter, EC member; Sarah Strand, Executive Director; Hanne Christiansen, President; Chris Burn, Senior Vice-President; Andrey Abramov, EC member; Isabelle Gärtner-Roer, Vice-President.

Hanne H. Christiansen

IPA EXECUTIVE COMMITTEE, 2018-2020



PRESIDENT

Prof. Hanne H. Christiansen
Arctic Geology Department
The University Centre in
Svalbard (UNIS)
Norway



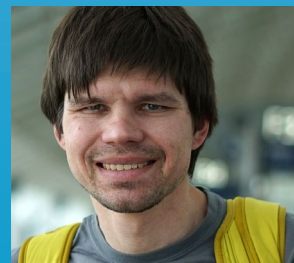
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EXECUTIVE DIRECTOR

Sarah M. Strand, PhD candidate
Arctic Geology Department
The University Centre in Svalbard
(UNIS), Norway

The 1st Southern Hemisphere Conference on Permafrost (SouthCOP)

BY MEGAN BALKS, CONFERENCE CONVENOR



The SouthCOP conference attracted 115 delegates from 18 countries, of which about 45% were PYRN/early-career researchers. The conference included multi-day fieldtrips both before and after, three days of scientific sessions, two mid-conference fieldtrips, a PYRN meet-a-mentor networking event, a PYRN social event, and a conference dinner.

PRE-CONFERENCE FIELDTRIP

The pre-conference fieldtrip, led by Assoc. Prof. Peter Almond from Lincoln University, travelled from Christchurch to Queenstown over three days with 28 participants, including helpers, Megan and Errol Balks. Highlights included the Christchurch International Antarctic Centre, a visit to Antarctica New Zealand to learn about the logistics of the New Zealand Antarctic Programme, study of glacial landforms in the Rakaia Gorge with views of a flood-



Conference welcome by local Māori people

ed Rakaia River, and some strong nor'wester winds. A day was spent at the Aoraki/Mount Cook National Park. Some participants opted for a boat ride on the rapidly forming pro-glacial Lake Tasman, while others viewed the moraines associated with both the Tasman and Hooker Glaciers. En-route from Mount Cook to Queenstown, the group investigated the landscapes and geological and glacial history of the region with stops at Lyndis Pass, the Bendigo gold mining area, and lunch at Carrick winery near Bannockburn.

CONFERENCE SESSIONS

The conference opened with a welcome from local Māori people, along with an opening address from IPA President Hanne Christiansen. The first plenary address entitled the "Impermanence of Permafrost" was given by previous IPA President, Antoni Lewkowicz. Over the course of the conference other

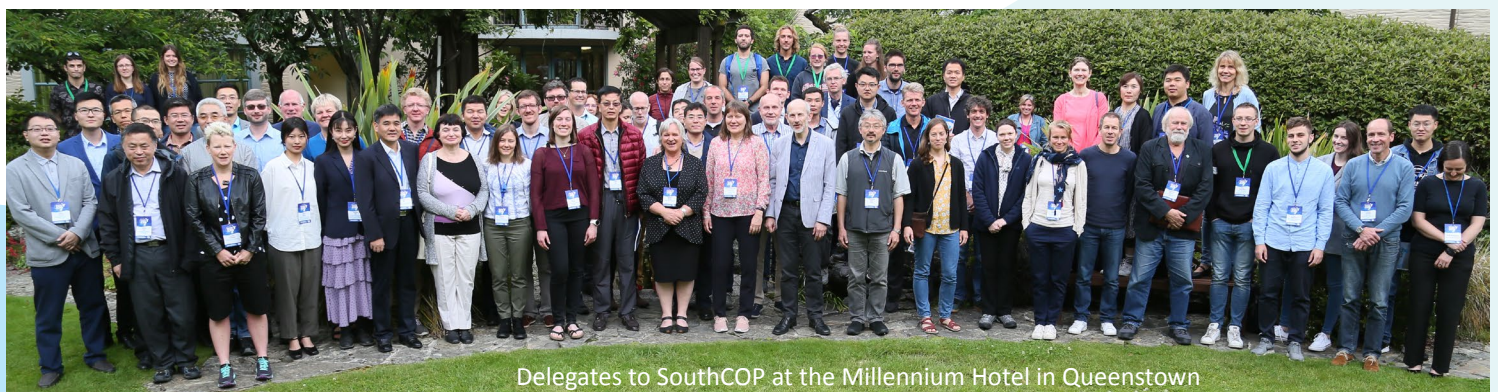


Boating on pro-glacial Lake Tasman

plenary speakers included: Fiona Shanhun (NZ's Antarctic Science programme) and Vicky Singleton (engineering considerations in Scott Base redevelopment) from Antarctica New Zealand (a major sponsor of the conference); reviews of Antarctic soil and permafrost research from Drs. Tanya O'Neill (NZ), Alexey Lupachev (Russia) and Thomas Schmid (Spain); and aspects related to permafrost engineering from Michael Krautblatter (Germany) and Fujun Niu (China). A combined plenary and public session, which attracted a number of Queenstown locals, was presented by David Barrell (Institute of Geological and Nuclear Sciences, GNS). This presentation gave an overview of the geological history of the Southern Alps and Queenstown/central Otago area as a lead-in to the mid-conference fieldtrips. A total of 16 concurrent sessions were held over three days covering the full range of topics of interest to the permafrost community. The 30 posters presented were available for viewing throughout the conference in the refreshments area.

PYRN EVENTS

A speed-dating style meet-a-mentor



Delegates to SouthCOP at the Millennium Hotel in Queenstown

event was held with PYRN members and volunteer senior researchers who were willing to act as mentors. The event was “round-robin” style, with each PYRN member (mentee) given about 5 minutes to discuss their interests with each mentor. Contact details were exchanged so that the PYRN members have the option to contact one of the mentors to develop a long-term mentoring (advisory) relationship.

A social event with pizzas, drinks, and bowls was held at the Queenstown bowling club. A good time was had by all, with many playing lawn bowls for the first time.

MID-CONFERENCE FIELDTRIPS

There were two mid-conference fieldtrips: one travelled to the Fiordland area with visits to Lake Manapouri, the Wilmot Pass and Doubtful Sound, and the other highlighted the geology and landforms of the Wakatipu Basin and Central Otago, led by David Barrell (GNS).

CONFERENCE DINNER

The superb conference dinner was held at the Stratosfare Restaurant on the slopes of Mt. Ben Lomond, and included a gondola ride and a spectacular view of Queenstown, Lake Wakatipu and the Remarkables Mountain Range.

POST-CONFERENCE FIELDTRIP

Due to heavy rain on the west coast of the South Island, many roads were closed by landslides and flooding. As a result, the post-conference fieldtrip was not able to access the Fox and Franz Joseph glaciers. However, the 20 participants made the most of the opportunity and travelled through Haast Pass to the west coast. The group crossed the Alpine Fault, a major geological feature of New Zealand. The Alpine Fault runs the length of the Southern Alps and offsets 430 km of rocks from Fiordland to the Nelson

area. Participants examined a fascinating dune sequence in South Westland associated with fault movement and loess from the Haast River. In typical Westland rain (mean annual rainfall is 3-10 m), we visited some pristine rainforest and then drove across the rainfall gradient to Central Otago (NZ’s driest region with mean annual rainfall as low as 300 mm/yr), and up to the highest public road point in NZ to look for evidence of periglacial action and to admire the schist tor landscape. The final day we returned to Christchurch via the Moeraki Boulders and a famous loess section that records the stadials of the last glaciation, near Oamaru.

FINAL COMMENTS

The conference closed with warm invitations to attend future IPA conferences. We are pleased to note that our Chilean colleagues are hoping to organise the 2nd Southern Hemisphere Conference on Permafrost.

Thanks to everyone who helped make SouthCOP a success, including:

- The delegates to the conference for their participation and sharing their current research and insights. Without you such a meeting is not possible!
- The conference steering committee: Hanne Christiansen, Sarah Strand, Peter Almond, Tanya



Participants on the mid-conference fieldtrip led by David Barrell (GNS) learned about the Clyde Dam and landslide stabilization efforts made during its construction.



View of the Remarkables Mountain Range, Lake Wakatipu, and Queenstown taken from the Stratosfare Restaurant during the conference dinner.

O'Neill, Fiona Shanhun, Annette Carshalton, Mauro Guglielmin, Gonçalo Vieira, Ian Meiklejohn, Shelley MacDonell, Carlos Schaefer, Britta Sannel, Fujun Niu, and Marc Oliva.

- IPA Executive Committee for supporting this meeting as part of the IPA's strategy.
- Fieldtrip leaders, Peter Almond (pre- and post-conference), David Barrell (mid-conference), and Andre Eger (assistance with post-conference fieldtrip).
- Annette Carshalton for leading organization of the PYRN events.
- Errol Balks for technical assistance with fieldtrips and conference activities.
- Lea Boodee and the entire On Cue team, who did all the administration and financial management, and managed registrations, bookings, enquiries, the conference website, and so much more, ensuring that everything ran smoothly.

CONGRATULATIONS TO THE SOUTHCOP PYRN-IPA AWARD WINNERS

Best oral presentation:

1st place: **Yury Dvornikov**, Earth Cryosphere Institute of Tyumen Scientific Centre. Conceptual model of formation and evolution of gas emission craters on Yamal peninsula.
2nd place: **Eleanor Jones**, The University Centre in Svalbard. High Arctic Permafrost Biogeochemistry Under Climate Change.

Best poster presentation:

1st place: **Raul-David Serban**, State Key Laboratory of Frozen Soils Engineering, Northwest Institute of Eco-environment and Resources. Surface water bodies mapping using different remote sensing methods in a small permafrost landscape.
2nd place: **Brinna Rick**, Colorado State University. Rock glaciers as climate resilient cold-water reservoirs in alpine basins within the Colorado Rocky Mountains.



Left: In one day, the post-conference fieldtrip went from pristine rain forest near sea level in the South Westland World Heritage area to 1300 m altitude at the top of NZ's highest road, the Nevis road, in the driest region of New Zealand.

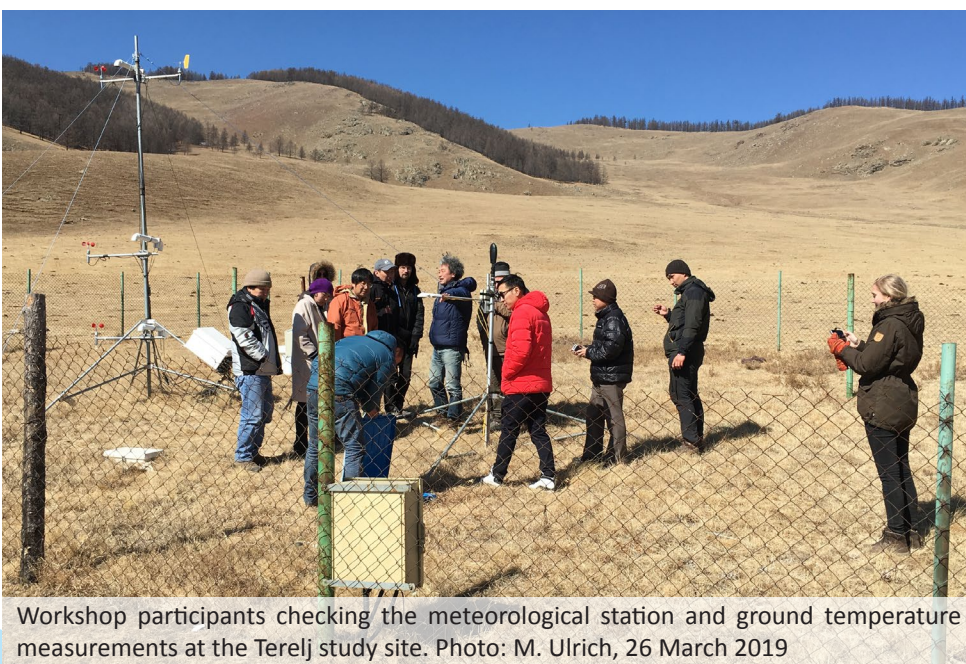


ACTION GROUP REPORT

Permafrost and Culture (PaC):

BY ACTION GROUP LEADERS, JOACHIM OTTO HABECK, UNIVERSITY OF HAMBURG, GERMANY, AND MATHIAS ULRICH, LEIPZIG UNIVERSITY, GERMANY

Led by a team of social anthropologists and physical geographers, this initiative seeks to investigate past and present human land use in permafrost landscapes and to assess the impacts of climate-related landscape changes on rural livelihoods across northern Eurasia. The initiative took off in 2014, when IASC funded an ICARP-III Workshop at the Arctic Science Summit Week in Helsinki. As a result, the IPA constituted an Action Group to more closely investigate indigenous land use in permafrost regions. First the Action Group held a conference in 2015 in Yakutsk, providing a synthesis of permafrost research



Workshop participants checking the meteorological station and ground temperature measurements at the Terelj study site. Photo: M. Ulrich, 26 March 2019

and social science scholarship on thermokarst basins in Central Yakutia and Sakha animal husbandry. With the intention to attain a comparative perspective for more permafrost areas, the group's second phase was implemented in the lowland area just west of the Polar Urals, a region with comparatively "warm" and sensitive permafrost and relatively high grazing pressure. A workshop organized in Vorkuta in 2017 made evident that in this region, the linkage between permafrost degradation and pastoralism is mediated by vegetation change (see *Frozen Ground* 41: 3-5, for details). Most recently, the group expanded to a third region, studying animal husbandry and farming in permafrost areas of Northern Mongolia.

In Mongolia, permafrost is critical to the water needs of the grasslands and pastures upon which numerous livestock herders depend. Without permafrost, vast areas of present-day pasturelands in Mongolia would not exist, given the country's overall arid climate. Similar to neighboring Siberia, pastoralism is an important source of income and subsistence for many inhabitants. This form of land use is strongly dependent on environmental conditions. In permafrost regions, changes in the landscape and thus in the resource base may proceed rather rapidly and in unprecedented

ways. Inversely, animal husbandry can also have a significant impact on local and regional environmental conditions, as was demonstrated in earlier workshops of this research initiative.

In March 2019, A. Dashtseren (Institute of Geography and Geology, Mongolian Academy of Sciences) and J. O. Habeck (Institute for Social and Cultural Anthropology, University of Hamburg) conducted short-term field research in Khuder (Selenge District), a region characterized by both agricultural farmlands and extensive pastures at the margins of continuous permafrost. Immediately after that, they held a workshop on "Permafrost Dynamics and Pastoral Land Use in Northern Mongolia" with about 15 participants from Mongolia, Finland, Germany, Japan, Russia, and the United States. It included a special session with students of geography from Ulaanbaatar University and a field excursion to the Terelj study site. A key message of this workshop is that solar radiation and landscape aspect (e.g. north-facing slopes vs south-facing slopes) have a strong influence on local hydrology, vegetation and pasture conditions. Logging and heavy grazing have the potential to exert major changes on permafrost – and thus on water resources and local land-use conditions.

This IPA Action Group has achieved not only a stronger syn-

thesis of social and geo-sciences, but has also facilitated a number of publications, among these a review and perspective article in the journal *Anthropocene* (Crate et al., 2017, <https://doi.org/10.1016/j.anthro.2017.06.001>). Subsequently, Action Group members have contributed to a Russian-language outreach book entitled "Permafrost and Culture: Global Warming and the Sakha Republic (Yakutia) of the Russian Federation", edited by Hiroki Takakura et al. (2019). Summarizing the outcome of joint work by Japanese, Russian and German social and natural scientists, this book is going to be used as teaching material at schools in the Republic of Sakha (Yakutia) and is likely to gain a considerable readership among the wider public of this vast permafrost region.

The Action Group plans to conclude the series of workshops (Yakutsk, Vorkuta, Ulaanbaatar) by comparing the regional findings in detail, publishing a scientific synthesis, and presenting the key findings in separate papers. The group's work exemplifies the diversity of environmental and social-economic processes intersecting in land use and permafrost landscape dynamics. Action Group members are designing future projects including a comparative study in Northern and Central Yakutia and a research project on land use under permafrost conditions in northern Mongolia.



Aufeis and yaks at the Terelj study site, with a panoramic view on south-facing slopes without trees and permafrost. The forest at Terelj is distributed in a mosaic pattern, covering mainly north-facing slopes and overlapping considerably with permafrost distribution. Photo by M. Ulrich, 26 March 2019

Rock glacier inventories and kinematics

BY ACTION GROUP LEADER, REYNALD DELALOYE, UNIVERSITY OF FRIBOURG, SWITZERLAND

Mountain permafrost is almost invisible in most representations of permafrost on Earth. Nevertheless, rock glaciers – a major landform associated with mountain permafrost – are abundant and sensitive to climate change. Rock glacier inventories have been set up for decades all around the world, yet without any real coordination, making their global assemblage and uniform comparison infeasible. Additionally, quantitative information about kinematics has been made available for numerous rock glaciers, particularly with the development of remote sensing techniques.

The Action Group ‘Rock glacier inventories and kinematics’ was launched in 2018. It intends to coordinate the definition of standard guidelines for inventorying rock glaciers globally, including indications on the activity rate (task 1); to promote rock glacier kinematics as an associated parameter of the Essential Climate Variable (ECV) permafrost, in order to represent the evolution of mountain permafrost (task 2); and to develop a dedicated database/web platform (task 3).

In 2019, the Action Group focused its efforts on the first task. Defining standard guidelines for inventorying rock glaciers has been divided into three sub-tasks, namely the definition of the main concepts and principles (1.1), the establishment of practical inventorying guidelines (1.2), and the establishment of a technical (operational) manual on how to implement a rock glacier inventory in an open-access database (1.3). A workshop was held in Evolène, Switzerland on 23-27 September 2019; 42 scientists participated. The workshop was a combination of excursions to visit local rock glaciers and discussion sessions. It was focused on the final preparation of a document regarding the baseline concepts for inventorying rock glaciers at a global scale (1.1) and on answering open questions after a preparatory round of comments in June-July 2019. A

revised version of the baseline concepts, resulting from the workshop, was made broadly available for review in November 2019. The final version will be released for approval by the Action Group members in early 2020, and this will be the basis on which the practical inventorying guidelines are built during the next months.

The Action Group’s second task will be started in 2020. A second workshop will take place in Fribourg, Switzerland on 11-13 February. It will mainly be dedicated to the preparation of products derived from the monitoring of rock glacier kinematics, which could be integrated as an associated parameter of the ECV permafrost. We will focus on the definition of the appropriate standards for monitoring rock glacier activity at a regional scale, in order to determine the data needed to assess temporal evolution with decadal to intra-decadal time steps.

All information about the Action Group is available on our webpage (<https://www3.unifr.ch/geo/geomorphology/en/research/ipa-action-group-rock-glacier/>). Action Group participation is open to everyone via our mailing list, which had 120 subscribers at the end of 2019 from more than 20 countries in Asia, North and South America, and Europe.



Left: Participants of the workshop in Evolène, Switzerland, during the excursion to the Becs-de-Bosson rock glacier (in the background); photo: A. Kellerer-Pirklbauer. Right: The Lona rock glacier at the outer terminal margin of a Little Ice Age glacier forefield, Swiss Alps.

Permafrost Young Researchers Network (PYRN)

BY HELENA BERGSTEDT, SAMUEL GAGNON, ANNETTE CARSHALTON AND DMITRY NEKRASOV, ON BEHALF OF THE PYRN EXCOM AND COUNCIL

The Permafrost Young Researchers Network aims to foster collaboration and promote future generations of permafrost researchers. If you are a young permafrost researcher we encourage you to become a member by signing up on our website. To engage further with us, follow us on social media and use the tag @pyrn_official or hashtag #pyrn on Twitter, Instagram or Facebook to share your updates or pictures with the PYRN community.

ARCTICNET'S ANNUAL SCIENTIFIC MEETING

Every year, the ArcticNet center of excellence gathers members from Canada and abroad at its annual scientific meeting. The 2019 meeting took place in Halifax, Nova Scotia from 2-5 December. During the first day, the ArcticNet Student Association organized a Student Day, which consisted of a series of workshops and panels for graduate students and early career scientists. At the end of the day, APECS and PYRN co-organized a social evening at the Rockbottom Brewpub where young researchers had the opportunity to mingle with new acquaintances and old friends.

SOUTHCOP

PYRN New Zealand held several events during SouthCOP in December. Six scholarships were granted by the IPA for PYRN members to attend, and these students helped with registrations, loading talks and fieldtrip logistics. A speed mentoring event was organized by PYRN with 25 people taking part. Participants came from China, Japan, Australia, North America, Chile, England, Denmark, Sweden, and

New Zealand. Both the mentors and mentees enjoyed the event and found it useful with hope for long-term mentoring relationships developing. The PYRN social event was held at the Queenstown Bowling Club, one of the most scenic bowling clubs in the country. Here, the group ate pizza and tried their hand at New Zealand lawn bowling. All the sessions at the conference had either a student or PYRN member act as a co-convener. This allowed members to learn the skills needed to run a conference session in a supportive environment. Four PYRN-IPA awards were granted: the top poster award went to Brianna Rick, with the second-place poster going to Raul-David Șerban. The top oral presentation went to Yury Dvornikov, and the second-place talk went to Eleanor Jones. See page 5 for the full titles of these presentations.

PYRN RUSSIA

PYRN Russia is the largest regional branch within PYRN with around 300 young researchers (students, PhD students, specialists) from 50 institutions and 20+ cities. You can find PYRN Russia online at vk.com/pyrn_russia.

PYRN Russia held two "How did I spend this summer" meetings at the Institute of Geography, Russian Academy of Sciences. Young permafrost researchers, mainly from the geography and geology faculties, shared their summer field experiences, including photos and unforgettable stories about their trips and their research. PYRN Russia also held a lecture by Evgeny Panchenko (Senior Specialist on geospatial technologies at ESRI CIS) about technological aspects of ArcGIS and possible implementation of these aspects by PYRN members. Both



An APECS & PYRN social evening was held as part of ArcticNet's Annual Scientific Meeting.



PYRN members tried lawn bowling at the Queenstown Bowling Club as part of SouthCOP.



PYRN's speed mentoring event was held immediately before SouthCOP.



Left: One of PYRN Russia’s “How did I spend this summer” meetings at the Institute of Geography, Russian Academy of Sciences. Right: PYRN Russia hosted a lecture by Evgeny Panchenko, Senior Specialist on geospatial technologies at ESRI CIS.



The PYRN Russia Workshop took place during the Pushchino Permafrost Conference and included a social event held in a local cafe, where participants competed in a permafrost-themed quiz.

CONTINUED FROM PAGE 8

meetings were streamed via our Instagram account @pyrn_official to reach those who couldn’t attend.

The PYRN Russia Workshop took place on 15 April during the Pushchino Permafrost Conference “Solving the puzzles from cryosphere”. A PYRN evening social event was held in the cozy cafe “Katyusha”. The goals of the event were friendly and productive collaboration between PYRN members, making new connections, listening to stories from senior colleagues and building team skills while completing the challenging ‘PermaQuiz’ prepared by PYRN Council Member Alexey Maslakov. PYRN was also one of the Pushchino conference supporters. Three young researchers won PYRN poster awards: Elena Babkina, Lyudmila Lebedeva, and Ruslan Khairullin. Elizaveta Uspenskaya won the PYRN oral presentation award (5000 rubles prize). See the photos of the winners to the right.

AGU FALL MEETING

During AGU Fall Meeting 2019, PYRN joined the US Permafrost Association to hold an event at the Thirsty Bear Brewery where early career researchers and senior scientists could get to know each other and network. During the event, the USPA/PYRN - North America AGU travel grants were awarded to the recipients. The event featured food, drinks and some spirited late-night games of table football/foosball.

PYRN MEMBERS REVIEWING IPCC REPORTS

For some time now, PYRN has joined forces with APECS and other early career organizations to organize group reviews of different IPCC reports. Many of our members took the opportunity to participate in the important process of reviewing the IPCC reports before publication. This will definitely continue, so look out for future review calls.



Clockwise from top left: Pushchino Permafrost Conference PYRN poster presentation award winners Elena Babkina, Lyudmila Lebedeva, and Ruslan Khairullin, and PYRN oral presentation award winner Elizaveta Uspenskaya.



Website: <https://pyrn.arcticportal.org/>

Email: contact@pyrn.org

The Global Terrestrial Network for Permafrost (GTN-P)

BY GTN-P STEERING COMMITTEE CHAIR, DMITRY STRELETSKIY, GEORGE WASHINGTON UNIVERSITY, USA, AND DIRECTOR OF THE SECRETARIAT, ANNA IRRGANG, AWI POTSDAM, GERMANY

PUBLICATIONS

More than 60 publications were published using GTN-P data in 2019, including analysis of site-specific and regional trends in permafrost, and validations of modeling and remote sensing products. GTN-P members continued to contribute to the State of the Climate Report, and national and international assessments of climate change. One study, co-authored by numerous GTN-P members and led by Boris Biskaborn, was published in Nature Communications in January. The article received more than 21,000 views and was cited more than 30 times in 2019, which clearly shows the need for data on permafrost changes across various regions.

DATA SERVICE

GTN-P continued to provide users with up-to-date information on permafrost thermal state and active layer thickness. The GTN-P website was visited by about 3000 individual users, and more than 1500 of them used the database in 2019. We thank all field investigators and National Correspondents for their time and effort in collection of observational data. We also thank staff of the Arctic Portal for their ongoing work on the GTN-P webpage and database. Visit <http://gtnpdata-base.org/> to access the latest data on permafrost temperature and active layer thickness.

GTN-P AND THE GLOBAL OBSERVING SYSTEM FOR CLIMATE (GCOS)

GTN-P continued to work towards defining products and requirements for the next implementation plan. While the thermal state of permafrost and active layer thickness are

GTN-P governance structure (2018-2020)



existing parameters of the ECV permafrost, rock glacier kinematics and thaw subsidence are new permafrost-related products that are currently under consideration by GCOS and will be further defined using community input.

CONFERENCES AND WORKSHOPS

GTN-P held a productive session at SouthCOP in Queenstown, New Zealand, December 4-14. We sincerely thank Megan Balks (New Zealand National Correspondent) for the warm welcome and successful conference!

The GTN-P SC is in the process of rescheduling the National Correspondent Meeting originally scheduled for ICOP 2020 in Lanzhou, China. GTN-P will continue to host sessions at IPA conferences, including at the 2021 RCOP in Boulder, CO, USA. A physical meeting will also likely take place at this conference.

GTN-P STEERING COMMITTEE (SC)

GTN-P is seeking nominations from

the National Correspondents to take on leadership roles in advancing the network to meet future challenges and goals. More information on GTN-P governance is available in the GTN-P Strategy and Implementation plan at <http://library.arctic-portal.org/1938/>. All National Correspondents are eligible to submit self-nominations or nominate a colleague by email to the GTN-P Secretariat no later than 31 May (please make sure that the person is aware and agrees to be nominated).

We thank all contributors for their engagement with the network and sincerely thank the IPA and AWI for their continuous support. Please visit www.gtnp.org for more information about the network, data access and news updates. For any inquiries regarding GTN-P please contact GTNP-Secretariat@awi.de.



Education & Outreach

BY CO-CHAIRS, ANNA KLENE, UNIVERSITY OF MONTANA, USA, AND YLVA SJÖBERG, STOCKHOLM UNIVERSITY, SWEDEN

The IPA Standing Committee on Education and Outreach coordinates and promotes permafrost education and outreach to all generations across the globe. Contact the committee through the IPA Secretariat if you want to share any planned or accomplished activities.

ACTIVITIES AT SOUTHCOP

We had a very well attended session at SouthCOP with two speakers discussing community involvement in permafrost, one from each hemisphere. There were several poster presentations as well.

FROZEN-GROUND CARTOONS (FGC): LATEST UPDATES

This project started as an IPA Action Group (2016-2018) and has now evolved into a multilingual outreach project called “Permafrost on All Channels” (<https://frozengroundcartoon.com/>). Russian, Danish, Greenlandic, Sami, Chinese, and Luxembourgish translations of the original comics will be released soon. An illustrated audiobook following a mosquito’s adventures with a group of permafrost researchers is also in the pipeline. Please check

out the resources and contact the team for more information (frozen-groundcartoon@gmail.com).

K-12 ACTIVITIES

Workshops bringing the Frozen-Ground Cartoons alive were held in November in several Luxembourg high schools, with support from the Luxembourg National Research Fund and SCRIPT, a Luxembourg government entity focusing on the coordination of educational and technological research and innovation. The students tested the demo versions of the FGC boardgame and augmented reality app, which are planned to be released in 2020.

NEW BOOK: PERMAFROST AND CULTURE

A new book “Permafrost and Culture: Global Warming and the Sakha Republic (Yakutia) of the Russian Federation” has been published as a result of long-term Russian-Japanese research collaboration and the IPA Action Group Permafrost and Culture. The target audience for the book is primarily high school and university students. The book

is available in Russian at <http://hdl.handle.net/10097/00126484>.

NEW ONLINE RESOURCES

INTERACT, together with Tomsk State University and Wicked Weather Watch, have produced a toolkit on permafrost and glaciers for teachers, including a series of animated videos on permafrost available on their website: <https://eu-interact.org/arctic-awareness/>.

INTERNATIONAL FIELD COURSES

In July 2019, the NSF-funded Arctic PIRE field course brought together faculty and students from The George Washington University, Lomonosov Moscow State University, Michigan State University, University of Alaska, University of Virginia, and the Massachusetts Institute of Technology. The course began in Anchorage, continued to Fairbanks, and then divided into two groups. One group, focusing on sustainable Arctic development, went to Whitehorse, Yukon, and the other, focusing on CALM permafrost monitoring procedures, continued to Toolik Field Station on the North Slope of Alaska. The second group visited a number of different CALM installations on the North Slope to learn about active layer measurements and thermal and subsidence monitoring.

The first intensive FROZEN CANOES course on “Design of Roads



The Frozen-Ground Cartoons were promoted to high school students in Luxembourg (left) and found a new audience in French President E. Macron (below).



and Railways in Cold Climate” was held in October at the Norwegian University of Science and Technology (NTNU) in Trondheim, Norway. Twenty-six graduate students and professionals in engineering and geosciences coming from Canada, Norway, Sweden and Russia participated. The next FROZEN CANOES course will focus on “High-Arctic permafrost geotechnics and geohazards” in Longyearbyen, Svalbard in June 2020. For more information on FROZEN CANOES, visit www.ntnu.edu/ibm/frozen-canoes.

In Sept./Oct. 2019, APECS and AWI organized a six week training course in the central Arctic on the Russian icebreaking research vessel Akademik Fedorov, during the first leg of the MOSAiC expedition. Twenty young researchers attend-

ed various science lectures, including one on periglacial features and subsea permafrost, helped with field work on the sea ice, and were trained in science communication to serve as MOSAiC Ambassadors for the full year of MOSAiC. More information can be found here: <https://www.apecs.is/outreach/mosaic-school-outreach/mosaic-school-2019.html>. The main sup-

port for the MOSAiC School was received from [ARICE](#) and [IASC](#), as well as from [CliC](#) and [YOPP](#).

WEB AND SOCIAL MEDIA

On our [webpage](#), you can find more information about permafrost education and outreach activities, including links to useful online resources. Please contact us if you want to know more about the work of the committee.



STANDING COMMITTEE REPORT

ANTPAS - Antarctic Permafrost, Periglacial Environments and Soils

BY CO-CHAIR, MARC OLIVA, UNIVERSITY OF BARCELONA, SPAIN

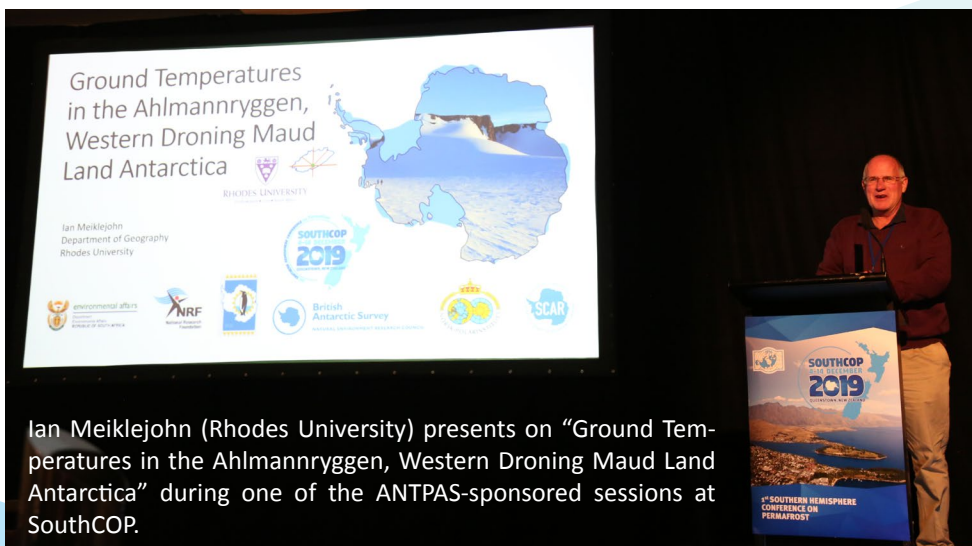
ANTPAS participated in the XIII International Symposium on Antarctic Earth Science (ISAES 2019) that took place in Incheon, Republic of Korea, 22-26 July 2019. Here, ANTPAS chairs coordinated a session on “Past and present permafrost changes in Antarctica” that included contributions from researchers working with permafrost temperatures, active layer thermal regime and past permafrost environments.

In addition, ANTPAS organized two sessions at SouthCOP: “ANTPAS: Antarctic permafrost, soils and ground ice” and “Methods to measure, monitor, and sample cryosols and permafrost/Past environments in permafrost regions”. This was the first IPA conference in the Southern

Hemisphere and was an excellent opportunity for permafrost researchers working in Antarctica to present their latest findings and explore future collaborations. The sessions included both oral and poster presentations covering

a wide range of topics such as: permafrost thermal state, active layer dynamics, cryogenic soils, infrastructure in permafrost areas and past permafrost environments.

The Iberian permafrost community held its biennial Meeting in Jaca (Huesca, Spain) from 25-27 June 2019 (<https://ipaiberico2019.csic.es/>). This was the VII Iberian Conference of the IPA, where several ANTPAS members met and discussed their latest research activities on permafrost dynamics in the Antarctic Peninsula region.



Ian Meiklejohn (Rhodes University) presents on “Ground Temperatures in the Ahlmannryggen, Western Droning Maud Land Antarctica” during one of the ANTPAS-sponsored sessions at SouthCOP.

Glacier and Permafrost Hazards in Mountains (GAPHAZ)

BY CHAIR, DUNCAN QUINCEY, UNIVERSITY OF LEEDS, UK

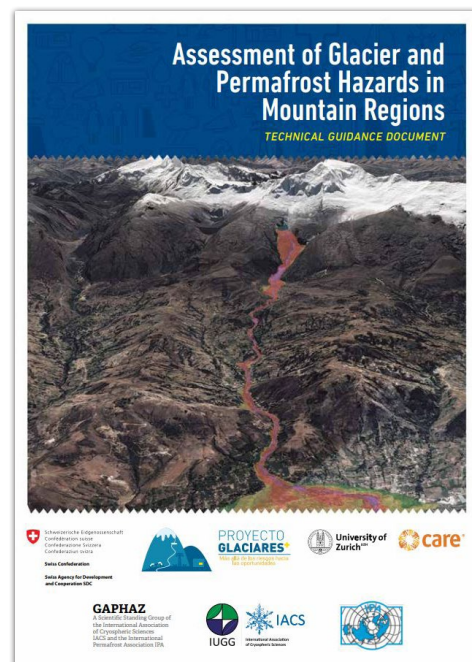
GAPHAZ was accepted as a Standing Committee of the International Permafrost Association (IPA) and the International Association of Cryospheric Sciences (IACS) in 2011. The group now has more than 100 members, including business organisations, policy makers and practitioners. Their main activities comprise holding regular meetings at national and international conferences (e.g. EGU) to share the state of the science, lobbying and influencing major policy-related meetings on climate and climate change (e.g. UNFCCC Conference of Parties, COP25), generating publications both in the mainstream and grey literature on mountain hazard themes, and directing information to agencies in the face of emerging hazardous events.

GAPHAZ recently published a technical guidance document on the assessment of Glacier and Permafrost Hazards in Mountain Regions. It focuses on hazards that are directly conditioned or triggered by contemporary changes in mountain glaciers and permafrost. Emphasis is given to catastrophic mass flows that can travel far downstream or downslope, potentially leading to cascading processes and impacts. This includes ice avalanches and other glacier instabilities, rock or mixed rock-ice avalanches, para- or periglacial debris flows, and outburst floods from glacial lakes. In addition, it addresses glacier- and permafrost-related hazards that produce localised and on-site threats, such as land subsidence and deep instabilities, and is designed to be a resource for international and national agencies, responsible authorities and private companies.

This document is available in English and Spanish (with a Russian version in preparation) from the GAPHAZ website (<http://gaphaz.org/>).

Recent GAPHAZ activities include the completion of their 8-year self-evaluation in 2019, which was presented to IACS and the IPA during the IUGG assembly in Montreal. The evaluation was endorsed by both Associations, and the Group is now looking forward to another period of future collaboration to address projected changes in natural hazard frequency, magnitude and areas affected. They also co-organised a debris-covered glacier workshop held at the Geological Society in London in September, which promises to lead to several key publications to set future research agendas. At the recent Climate Conference COP25, a high-level policy space, GAPHAZ experts organised a side event in the Cryosphere Pavilion entitled: From data and models to public

investment in risk and water management in a changing cryosphere of the Andes. Such science-policy spaces are particularly important to foster science- and evidence-based policy making and to position GAPHAZ topics on the political agenda.



The GAPHAZ technical guidance document



Delegates of the co-organised GAPHAZ debris-covered glacier workshop in London, September 2019.

NEW PROJECT ANNOUNCEMENT

PermafrostNet

BY PERMAFROSTNET KNOWLEDGE MOBILIZATION AND COMMUNICATIONS COORDINATOR, TRISTAN MACLEAN, CARLETON UNIVERSITY, CANADA

NSERC [PermafrostNet](#) is a newly launched five-year research network that will unite key scholars and stakeholders from government agencies, industry and Indigenous communities with the common goal of boosting Canada's ability to adapt to permafrost thaw. This is an urgent strategic priority because permafrost underlies more than one-third of the Canadian land surface and its reaction to climate change — already clearly visible today — will persistently and pervasively reshape the Canadian North throughout the 21st century.

The network aims to boost Canada's ability to monitor, predict and adapt to large-scale permafrost thaw. The dominating influence of permafrost thaw on the safety, reliability and cost of infrastructure and on the lives of northerners has been clearly recognized in recent assessments and policy documents. The network will transform Canadian permafrost science, and its alignment with decision-making, by enabling systematic investigation, training the next generation of experts, translating and mobilizing knowledge, and positioning Canada as a decision-making leader in the Arctic. PermafrostNet focuses on one big question: Where and when is permafrost thaw occurring and what are the hazards arising from this? To achieve national-scale transformation of knowledge and practice, it has complementary research themes that require a critical mass and diversity that no single research group or agency can provide.



Attendees of the inaugural NSERC PermafrostNet AGM. Photo: Ariane Castagner.

PermafrostNet (NSERC Permafrost Partnership Network for Canada) is funded by Can\$5.5 million from the Natural Sciences and Engineering Research Council (NSERC) Strategic Partnership Grants for Networks along with Can\$5M cash and in-kind contributions from partners and participating institutions. It is comprised of researchers from 11 universities and over 40 partnering organizations, including those in industry, Indigenous and Northern communities, and federal, territorial, provincial and municipal government agencies. It is led by principal researcher Stephan Gruber, Canada Research Chair in Climate Change Impacts/Adaptation in Northern Canada at Carleton University. PermafrostNet currently has fourteen fully-funded [graduate positions available](#) (five MSc and eleven PhDs) at universities across Canada.

The PermafrostNet inaugural Annual General Meeting (AGM) was held in Ottawa, ON on the 6th and 7th of November 2019. It was a highly vibrant and successful event, featuring over 50 members of the network from across Canada, both in-person and attending remotely. There were participants from as far away as Sachs Harbour, Northwest Territories; Whitehorse, Yukon; and Churchill, Manitoba taking part. The two-day event featured a day of presentations and discussions, including break-out sessions for

each of the five research themes, and meetings of the Board of Directors, Scientific Committee and Knowledge Mobilization and Communications Committee. Most auspiciously, the AGM aligned with International Inuit Day. International Inuit Day has been held annually on November 7th since 2006, to coincide with the birth date of the late Eben Hopson, founder of the Inuit Circumpolar Council (ICC), a major international non-government organization representing approximately 180,000 Inuit of Alaska, Canada, Greenland, and Chukotka (Russia). In mid-November 2020 the 2nd PermafrostNet AGM will be hosted in Yellowknife alongside the Geoscience Forum, the Canadian Permafrost Association meeting and the Northwest Territories Government.

In late May 2020, PermafrostNet will be holding a series of events in Ottawa. This will include Playing Tundra, a mock-fieldwork campaign to share knowledge and build connections in Gatineau Park. The event will also feature a data workshop during which feedback and collaboration will help develop the network data standard.

You can follow PermafrostNet using @PermafrostNet on Twitter and Instagram, and on LinkedIn with NSERC PermafrostNet. You can subscribe to future newsletters [here](#).

Permafrost Discovery Gateway: A new online platform supporting knowledge-generation from big imagery

BY: ANNA K. LILJEDAHN & BENJAMIN M. JONES, UNIVERSITY OF ALASKA FAIRBANKS; KENTON MCHENRY, UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN; MATTHEW B. JONES & AMBER BUDDEN, ARCTIC DATA CENTER AT THE NATIONAL CENTER FOR ECOLOGICAL ANALYSIS AND SYNTHESIS; CHANDI WITHARANA, UNIVERSITY OF CONNECTICUT, USA, ON BEHALF OF THE ENTIRE PDG TEAM

In this multi-institutional US National Science Foundation (NSF) Navigating the New Arctic (NNA) project we seek to empower the broader Arctic community with an online platform, the Permafrost Discovery Gateway (PDG), aimed at making big imagery permafrost information accessible and discoverable to enable knowledge-generation by researchers and the public. Permafrost science, local engineering problems, as well as community planning and global carbon studies, have all faced challenges that hindered integration and knowledge advancements due to scale-decoupled coarse (>25 km²) pan-Arctic modeling projections and sparse point (<1 m²) field measurements (see Vorosmarty et al., 2018, “Opportunities and challenges in Arctic System Synthesis: A consensus report from the Arctic research community”). The Permafrost Discovery Gateway will bridge this gap by creating pan-Arctic data products that encompass relevant spatial (down to sub-meter) and temporal scales (down to daily) and by providing easy access and discovery of these large datasets through visualization tools accessible through an interactive web browser.

The project is a four-year-long collaboration involving eight organizations in its core team. The home of the PDG will be the Arctic Data Center at the National Center for Ecological Analysis and Synthesis (NCEAS) that is the data repository for all Arctic NSF-funded projects. [University of Alaska](#)

[Fairbanks](#) is the overall project lead, and the National Center for Supercomputing Applications (NCSA) at the University of Illinois at Urbana-Champaign will play a critical role in transforming the experimental work done at local scales using artificial intelligence to detect permafrost features into efficient workflows for larger, pan-Arctic scales. NCSA will also provide the project with a component called [Clowder](#), which supports data management, curation, and analysis and recently won an NSF Cyberinfrastructure for Sustained Scientific Innovation award. [Byrd Polar and Climate Research Center](#) at Ohio State University will refine their visualization tool [Fluid Earth Viewer](#) for the PDG user community. The University of Connecticut and the Alfred Wegener Institute are developing pan-Arctic remote sensing permafrost products and NASA will be contributing atmospheric geospatial datasets. The Center for Climate and Health at the Alaska Pacific University is, through the [Local Environmental Observers Network](#), serving as the link to Arctic community members and subsistence practitioners. A multitude of external collaborators, including individuals and organizations such as the [Polar Geospatial Center](#), enable content and design. This combination of existing resources will help keep the world informed about the rapidly changing Arctic landscape as it is transforming at a scale that is relevant to people and stakeholders.

The end-users serve as a



major source of guidance in the successful development of the PDG. Engagement of researchers, stakeholders, and industry from the outset are key to adoption and to ensure a well-designed, intuitive, user-focused gateway. Feedback topics may include current geospatial products to include, pan-Arctic applications of existing regional remote sensing models, how to most effectively visualize the information, and design of the overall PDG user experience including the interaction with the machine and deep learning model tools/extractors. Starting in spring 2020, the core team is holding online and in-person meetings to create an opportunity for user-specific dialogue and to ensure that each group's needs are adequately expressed, heard, and understood. At a minimum, in-person meetings will occur through short workshops during conferences, which in year 2020 will include the Alaska Tribal Conference on Environmental Management in Anchorage and the 16th International Circumpolar Remote Sensing Symposium in Fairbanks. Remote participation community meetings will be held

at least twice a year using Zoom. Project updates will be shared via the PDG website, Facebook group, and email list serve. In addition, the PDG webpage contains a link to leave written feedback to the core team.

Further information is available on the Permafrost Discovery Gateway project webpage, <https://permafrost.arcticdata.io/>.

Right: The Permafrost Discovery Gateway will include big imagery products such as a sub-meter resolution pan-Arctic tundra map of ice-wedge polygons, which represent ice-rich permafrost. Such information combined with geospatial datasets about infrastructure can support stakeholder risk assessments and mitigation efforts. Photo: Benjamin Jones.



PROJECT UPDATE

NUNATARYUK

BY PROJECT LEADER, HUGUES LANTUIT,
AWI POTSDAM, GERMANY

NUNATARYUK is a 5-year transdisciplinary research project (2017-2022) funded under the Horizon 2020 program of the European Union. The project brings together world-leading specialists in natural sciences and socio-economics in order to quantify and project organic matter, sediment and contaminant fluxes from thawing coastal and subsea permafrost and to accurately assess the implications of permafrost thaw for the indigenous populations, the local communities and the environment in the Arctic coastal areas.

The year 2019 marked a major milestone in the project, with a myriad of field campaigns across all disciplines in the project. Within natural sciences, the

year started with safety training and pre-campaign preparations and consultations. From April onwards, major field campaigns were conducted in the Mackenzie River, Peel River, Komakuk, Herschel Island, and the Beaufort Sea in Canada. In social sciences, the project groups visited Tiksi in northeastern Russia, Ilulissat and Qeqertarsuaq in Greenland and Longyearbyen in Svalbard.

At the end of September the consortium assembled in Nice, France for the 2nd General Assembly, during which the project was reviewed by the EU-hired external reviewers. The outcome was very positive and work is ongoing to meet the next objectives.

Major results so far include the first map of the distribution of submarine permafrost underneath the entire Arctic seabed (Overduin et al., 2019, <https://doi.org/10.1029/2018JC014675>), and an atlas presenting a collection of standardized indicators that

illustrate the state of the Arctic permafrost regions focusing on demography, society, economy, production, accessibility and infrastructure as well as physical conditions and resources in the Arctic.



NUNATARYUK 2nd General Assembly participants in Nice, France. Photo: Charlotte Haug

GlobPermafrost & CCI+ Permafrost

BY PROJECT LEADERS, ANNETT BARTSCH, B.GEOS, AUSTRIA AND TAZIO STROZZI, GAMMA REMOTE SENSING, SWITZERLAND

The Northern Hemisphere permafrost map, which was created within the European Space Agency project GlobPermafrost, has undergone rigorous assessment with the help of many regional experts in 2019. The outcome has been documented in a publication in *Earth Science Reviews* (<https://doi.org/10.1016/j.earscirev.2019.04.023>). Similarly, a map for the Southern Hemisphere has been prepared and specifically assessed for [Antarctica](#). The lowest near-surface permafrost temperature of $-33.5\text{ }^{\circ}\text{C}$ was modelled at Mount Markham in the Queen Elizabeth Range in the Transantarctic Mountains.

The step from using an equilibrium model (average of 2000-2016) to the utilization of a transient model (CryoGrid CCI) has been made within the framework of ESA's Climate Change Initiative. Timeseries (2003-2017) of mean annual ground temperature as well as active layer thickness for the Northern Hemisphere have been released in December 2019 (<http://cci.esa.int/Permafrost#news>). The GTN-P and CALM databases have been extensively used for validation of the permafrost modelling results. Further on, data from monitoring networks such as PERMOS in Switzerland and the meteorological monitoring program ROSHYDROMET in Russia as well as records stored on PANGAEA and the Arctic Data Centre have been included in the assessment.

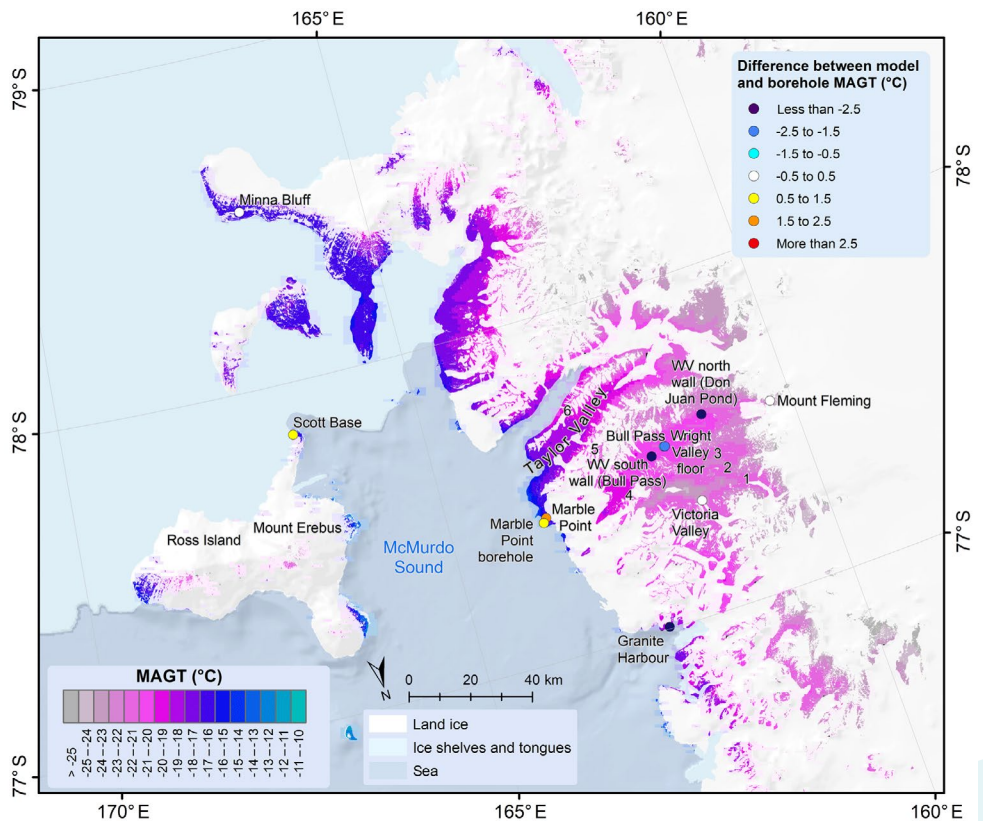
The CCI+ Permafrost project has been extended in 2019 covering "Rock glacier kinematics as a new associated parameter

of the ECV permafrost" with the Norwegian Research Centre NORCE and the University Centre in Svalbard (UNIS) as additional partners to Gamma, B.GEOS, GUIO and UNIFR. It complements the modelling activities to address the need for characterising mountain permafrost – and rock glaciers as one important element of mountain permafrost in particular

– as local indicators for climate change and direct impact on the society in mountainous areas. Study areas include Switzerland, Italy, France, Norway, Svalbard, Romania, Greenland, Tien Shan (Kazakhstan and Kyrgyzstan), Brooks Range (Alaska) and Central Andes (Argentina).

Joint workshops are foreseen with the IPA Action Group on rock glaciers at their meeting in February 2020, with the IASC T-MOSAic Remote Sensing Action Group at ASSW 2020 in Akureyri, and also with PYRN.

www.globpermafrost.info
<http://cci.esa.int/Permafrost>



Modelled permafrost temperatures in the McMurdo Dry Valleys, Antarctica from Obu et al., 2020, <https://doi.org/10.5194/tc-14-497-2020>.



The Annual Review Meeting for Year 1 with ESA successfully took place on 11 June 2019.

IN MEMORIAM

Hugh M. French

BY ANTONI LEWKOWICZ, UNIVERSITY OF OTTAWA, CANADA

Professor Dr. Hugh M. French died suddenly on 11 May 2019 in Victoria, British Columbia, Canada. He is internationally recognized as a specialist on periglacial processes and permafrost science. During his career as Professor at the University of Ottawa, he first visited the Arctic in 1967, and worked for the following 36 years, plus 16 additional years post-retirement. He wrote or co-authored more than 160 publications covering topics such as

ground ice formation and distribution, slope processes, natural and anthropogenic thermokarst, and frozen ground engineering. Hugh played very important roles in the International Permafrost Association, helping found it in 1983, and acted as Vice-President 1993-1998 and President 1998-2003. He also founded the journal *Permafrost and Periglacial Processes* which he edited for 16 years, and he wrote four editions of his textbook *The Periglacial Environment* over nearly 30 years, the last edition of which was published in 2017. He received many prizes for his work, including the International Permafrost Association's Lifetime Achievement Award

in 2016. The IPA offers its sincere condolences to Hugh's wife, Jill, and his many friends and international colleagues. He will be missed.



THE INTERNATIONAL PERMAFROST ASSOCIATION

The mission of the International Permafrost Association is to promote research in permafrost and permafrost-related fields within the global scientific and engineering communities, to support the activities of researchers in these disciplines, and to disseminate findings concerning permafrost to decision-makers, the general public, and educators.

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