

# FROZEN GROUND



The News Bulletin of the International Permafrost Association

Number 33, December 2009



# INTERNATIONAL PERMAFROST ASSOCIATION

The International Permafrost Association, founded in 1983, has as its objectives to foster the dissemination of knowledge concerning permafrost and to promote cooperation among persons and national or international organisations engaged in scientific investigation and engineering work on permafrost. Membership is through national Adhering Bodies and Associate Members. The IPA is governed by its officers and a Council consisting of representatives from 28 Adhering Bodies having interests in some aspect of theoretical, basic and applied frozen ground research, including permafrost, seasonal frost, artificial freezing and periglacial phenomena. Committees, Working Groups, and Task Forces organise and coordinate research activities and special projects.

The IPA became an Affiliated Organisation of the International Union of Geological Sciences (IUGS) in July 1989. Beginning in 1995 the IPA and the International Geographical Union (IGU) developed an Agreement of Cooperation, thus making IPA an affiliate of the IGU. The Association's primary responsibilities are convening International Permafrost Conferences, undertaking special projects such as preparing databases, maps, bibliographies, and glossaries, and coordinating international field programmes and networks. Conferences were held in West Lafayette, Indiana, U.S.A., 1963; in Yakutsk, Siberia, 1973; in Edmonton, Canada, 1978; in Fairbanks, Alaska, 1983; in Trondheim, Norway, 1988; in Beijing, China, 1993; in Yellowknife, Canada, 1998, in Zurich, Switzerland, 2003, and in Fairbanks, Alaska, in 2008. The Tenth conference will be in Tyumen, Russia, in 2012. Field excursions are an integral part of each Conference, and are organised by the host country.

## **Executive Committee 2008-2012**

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Professor Hugh M. French, Canada (1998-2003)  
Dr. Jerry Brown, U.S.A. (2003-2008)

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Data, Information and Communication  
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Antarctic Permafrost and Periglacial Environments  
Cryosol  
Coastal and Offshore Permafrost Dynamics  
Glacier and Permafrost Hazards in High Mountain Slopes  
Isotopes and Geochemistry of Permafrost  
Periglacial Landforms, Processes, and Climate  
Permafrost and Climate  
    Modeling and Mapping Subgroups  
Planetary Permafrost and Astrobiology  
Permafrost Engineering  
    Engineering Geology for Development in Permafrost Regions Subgroup

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Remote Sensing  
Subglacial Permafrost

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*Cover: View of a low-centered ice-wedge polygon field in the vicinity of Samoylov Island, Lena Delta, Siberia, Russia. Photograph provided by Constanze Piel, Alfred Wegener Institute for Polar and Marine Research, Potsdam, Germany.*

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INTERNATIONAL PERMAFROST ASSOCIATION  
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The IPA is a non-governmental association of national organisations and associates representing 28 countries. The success of the bulletin depends upon the willingness of IPA participants to supply information for publication. News items from any IPA participant or others are very welcome, as are interesting photographs. To submit news items or photos please contact:

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All issues of *Frozen Ground* are also available as PDF files on the IPA web site ([www.ipa-permafrost.org](http://www.ipa-permafrost.org)).

This issue of *Frozen Ground* was compiled and edited by Hugues Lantuit and Hans-Wolfgang Hubberten.

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# EXECUTIVE COMMITTEE REPORT

This year was a transition year for the International Permafrost Association (IPA), after the hugely successful Ninth International Conference on Permafrost, held in 2008 and before the Third European Conference on Permafrost to be held in 2010. The IPA used the time at hand to over-haul some of its internet presence, prepare for the deadlines related to the release of the outcomes of the International Polar Year (IPY), and initiate some new projects and programs that should help to sustain its visibility and relevance for the years to come.

Through a generous partnership with the Arctic Portal ([www.arcticportal.org](http://www.arcticportal.org)), based in Iceland, the IPA created a brand new website ([www.ipa-permafrost.org](http://www.ipa-permafrost.org)) that has helped to multiply by ten the number of visits to its pages. The website, based on a modern content management system is capable of handling not only the tasks performed by the former system, but also to dynamically generate content and to provide additional features such as image galleries, video and audio podcasts. In addition, the IPA now provides to the users of this website a mailing list (Permalist) specifically geared at permafrost science and engineering. This mailing list will form the main instrument of communication between the IPA and the members of the community at large.

The IPA also decided to establish a new award, the “IPA Lifetime Achievement Award” to acknowledge the lifetime contribution of individuals for outstanding permafrost science and engineering research, and/or for exceptional contributions to the international permafrost research community. Existing IPA awards were largely focused on young researchers and the IPA felt the need to recognize the contribution of many individuals involved in its activities as well as in permafrost research since its inception in 1983. This award will be made every two years at international and regional permafrost conferences

2009 was also a year of planning for the 2010 International Polar Year Oslo Science Conference. This conference will highlight the results of the International Polar Year as a whole and of the IPA in a specifically designed session chaired by Jerry Brown, former president of the IPA. The IPA has worked hard and will continue to do so to ensure a prominent presence at this conference and confirm the great expectations raised during the IPY. The main outcomes planned to be released in Oslo are the IPA-IPY snapshot which will feature the data results of the IPA-IPY projects (TSP, CAPP, ACCOnet and ANTPAS) as well as the release of a special issue in Permafrost and Periglacial Processes describing the scientific results of these projects. The IPA and the University of Ottawa organized a meeting in October 2009 in Ottawa to plan the release of these products in June 2010.

The IPA has also been busy preparing the next regional and international conferences. The organizers of the Third European Conference on Permafrost, which will be held in Longyearbyen, Svalbard in June 2010 opened the registration process in October for a conference that will surely be of considerable interest to the permafrost community given its range of scientific sessions and unique location. The IPA will hold its council during the conference and plans on introducing several new

initiatives that will hopefully set up the organization to tackle the scientific issues arising from the IPY. In parallel, the IPA is planning the next International Conference on Permafrost, that will held in summer 2012 in Tyumen, Russia. The Russian organizers have made some great efforts in securing the venues and infrastructure needed to organize a top level conference in a location prone to insightful field trips. This conference will see the IPA release several products updating its current map and data products.

On the international front, the IPA and its executive committee have been busy working on existing linkages with several other international organizations as well as initiating some new ones with some strategic partners. The IPA decided to enter into a tri-lateral agreement (Memorandum of Understanding) with the International Arctic Science Committee (IASC) and the Scientific Committee of Antarctic Research (SCAR). This formalization of the relationship between the three organizations came as a logical follow-up to the growing number of activities shared by the three organizations. Throughout the past years and in particular during the IPY, the IPA contributed to the Sustaining Arctic Observing Networks (SAON) initiative, itself coordinated by IASC, and provided several contributions to the Snow Water Ice and Permafrost (SWIPA) upcoming assessment of the Arctic Council, also coordinated by IASC. The IPA is now envisioning to contribute in a similar manner to the pan-Antarctic observing effort of SCAR. The IPA also strengthened its partnership with the World Meteorological Organization (WMO) through its involvement in the Climate and Cryosphere (CliC) project, the upcoming Global Cryosphere Watch (GCW) and most importantly through its involvement in the high profile WMO Executive Committee Panel of Experts on Polar Observations, Research and Services (EC-PORS). The IPA is now working hard on integrating the process linked to the involvement in these many organizations in order to streamline the reporting and data management workload associated with it.



*The Executive Committee met on October 19 in Ottawa. L-R: Vladimir Romanovsky, Hanne Christiansen, Hans-Wolfgang Hubberten, Antoni Lewkowicz, Hugues Lantuit (Secretariat). (Photograph provided by Antoni Lewkowicz)*

# BIPOLAR SCIENCE PUTS THE SPOTLIGHT ON PERMAFROST

International science organizations in the Arctic and Antarctic endorse the mission of the International Permafrost Association.

The increasingly bipolar involvement of the IPA and the growing expectations for the integration of permafrost data in other science realms is now documented in an official partnership with the leading international science organizations in the Arctic and Antarctic. The tri-partite Memorandum of Understanding (MoU) between IPA, the Scientific Committee on Antarctic Research (SCAR) and the International Arctic Science Committee (IASC) is a natural outcome of IPA's continued involvement in polar research over the past 25 years.



*Signature of the IPA-SCAR-IASC MoU. From left to right: V. Rachold (IASC), H.-W. Hubberten (IPA), C. Summerhayes (SCAR), H. Lantuit (IPA), K. Kristjánsson (IASC). (Photograph provided by Mare Pit)*

By placing their signatures in Bergen, Norway, last March, the presidents of the three organizations, Prof. Hans-Wolfgang Hubberten, Prof. Mahlon C. Kennicutt II and Dr. Kristján Kristjánsson identified a joint commitment to the excellence in the field of permafrost and polar research, to the pursuit of scientific advances, public awareness and advice to policy makers as well as professional development of young researchers.

## *Legacy and future developments*

The timing of the MoU was especially important to ensure that all three communities together make an integrated and comprehensive contribution to developing the International Polar Year (IPY 2007-2009) legacy. The development of *Sustaining Arctic Observing Networks* (SAON) is one of the current initiatives aimed at securing this legacy that will be of great importance for the future accessibility of research data and beneficial to the Arctic and permafrost researchers community.

At the beginning of IPY, both the Arctic Council and the World Meteorological Organization (WMO) urged member nations to maintain and extend long-term monitoring of change in the Arctic. It was from this concept that SAON

was created, envisioning unencumbered access to free, open and high quality data that contribute to pan-Arctic and global value-added services and societal benefits. Last April the Arctic Council agreed to take the lead in the continuation of the SAON process, in cooperation with IASC and other relevant partners. Formed in June 2009, the new SAON Steering Group consists of representatives from each of the eight Arctic Council member states, the six indigenous peoples organizations that are Permanent Participants of Arctic Council, the Working Groups of Arctic Council, IASC and the WMO. This Steering Group, co-chaired by the Arctic Monitoring and Assessment Program (AMAP) and IASC, has initiated work on several priority activities including:

- Identification of existing observing networks and opportunities for improving data access and data sharing;
- Improving the linkage between community-based monitoring and science-based monitoring; and
- Facilitating coordination and integration among activities supported by national agencies.

The SAON initiative is just one example that underlines the growing multidisciplinary and international character of polar science, which again provides a strong ground for the closer linkage between IPA, SCAR and IASC, not least in an exchange of views and experience on important scientific topics. The aim is that the three organizations by recognizing their common interests and practices in the MoU, will further enhance their cooperation in developing and facilitating integrated plans for permafrost and polar research.

For more information on the organizations in this article you can visit the websites at:

Scientific Committee on Antarctic Research:

- [www.scar.org](http://www.scar.org)

International Arctic Science Committee:

- [www.iasc.info](http://www.iasc.info)

Sustaining Arctic Observing Networks:

- [www.arcticobserving.org](http://www.arcticobserving.org)

Mare Pit ([mare.pit@iasc.info](mailto:mare.pit@iasc.info))

# WORKING GROUPS AND TASK FORCES REPORTS

## I. ANTARCTIC PERMAFROST AND PERIGLACIAL ENVIRONMENTS

Co-chairs

James Bockheim, USA (bockheim@wisc.edu)

Mauro Guglielmin, Italy (mauro.guglielmin@uninsubria.it)

Statement of goals:

- To develop a common web-accessible repository for permafrost and soils data;
- To complete thematic maps on Antarctic permafrost and soils (Transantarctic Mountains, the Antarctic Peninsula, and other regions);
- To establish a system of boreholes for providing data on permafrost and soil properties (GTN-P), records of past environmental change and recording permafrost responses to climate change;
- To develop a well-designed system for monitoring active-layer dynamics and periglacial processes in response to climate change along selected environmental gradients;
- To improve mobility and access to Antarctica by permafrost researchers through coordinated research.

To attain these goals, WG prepared and was awarded an International Polar Year (IPY) project, Antarctic Permafrost and Soils (ANTPAS), for coordinating national and individual research. More specifically, the aim was to create a database for permafrost within the framework of the Thermal State of Permafrost (TSP) and the Global Terrestrial Network-Permafrost (GTN-P) and for active-layer monitoring within the framework of the Circumpolar Active Layer Monitoring-South (CALM-S) and a Geographic Information System (GIS) for storing and analyzing these data.

Several members of the working group have assisted in preparing the SCAR document *Antarctic Climate Change and the Environment*. The working group wants to establish a network of permafrost and active layer monitoring sites as a contribution for the Standing Committee for Data Information and Communication (SCDIC), a division of the International Permafrost Association (IPA). The WG also wants to prepare a permafrost map of Antarctica for which some provisional results were presented at the Ninth International Conference on Permafrost (NICOP) in July 2008, Fairbanks, Alaska. Map upgrades will be presented at the following three meetings in 2010:

- A Cryosol session at the World Soils Congress of the International Soil Science Society, Brisbane, Australia;
- A session on Permafrost and Periglacial Antarctic Environments at the Open Science SCAR meeting of Buenos Aires; and
- At the IPY meeting in Oslo.

## 2. CRYOSOL

Co-chairs

Galina Mazhitova, Russia†

Eva-Maria Pfeiffer, Germany

(empfeiffer@ifb.uni-hamburg.de)

The Cryosol Working Group is an active joint group of the

IPA and the International Union of Soil Sciences (IUSS).

Statement of goals:

- To develop a Circumpolar Soil Carbon Database that can be used to improve our understanding of soil carbon distribution and dynamics in permafrost-affected soils
- To develop an Arctic and Antarctic soil databases to enhance the classification and distribution of permafrost soils
- To evaluate soil carbon dynamics, sink and sources in cold environments (at high latitudes and altitudes)
- To investigate the effect of global change on the genesis and properties of soils with permafrost
- To cooperate with other IPA and IUSS working groups and to supply them with the data on soil temperature and other soil properties.

The activities of CWG in 2008-2009 have been overshadowed by the death of our Vice-Chairperson Dr. Galina Mazhitova, Russia. We all lost a real friend and excellent scientist in the field of permafrost related soil carbon research. We will never forget her

Cryosol Working Group members have been participating in several projects of the International Polar Year (2007-2009). Two projects have been successfully realized under the leadership of the CWG-members and involved many group members. The project RASCHER was led by S. Goryachkin, Russia and the CAPP project was led by P. Kuhry, Sweden. The Antarctic project ANTPAS included CWG-members like J. Bockheim, USA, and M. Balks, New Zealand. Further activities in 2008 and 2009 can be summarized as follows:

- 2008/2009: Members of CWG contribute to the "NORTHERN CIRCUMPOLAR SOIL ATLAS", JRC, EU, Ispira, Italy
- 2008/2009: The CWG also share activities on carbon assessment in the International Year Planet Earth (IYPE).
- 2008/2009: The CAPP project presented results at the 33<sup>rd</sup> International Geological Congress in Oslo in August 2008.
- 2008: 9<sup>th</sup> International Conference on Permafrost (NICOP) in June/July 2009 in Fairbanks, Alaska, USA; was used by 11 CWG members for the scientific exchange with own oral and poster presentations. NICOP was also a good location for a common working group meeting to discuss future activities.
- 2009: 2<sup>th</sup> Workshop on Carbon Pools in Permafrost Regions, CAPP meeting in June 2009 in Stockholm, Sweden. The meeting was organized by P. Kuhry, Sweden and four group members have participated the workshop with an own presentations.
- 2009: 5<sup>th</sup> International Conference on Cryopedology in September 2009, Ulan-Ude, Buryatia, Russia. Four members could participate and discussed problems related to cold soils. Topics on the diversity of frost-affected soils and their role in ecosystems were discussed.

The CWG plan for the next year: Several members of CWG are engaged to the 19<sup>th</sup> World Congress of Soil Science, Brisbane, Australia in 2010. The CWG will present an own Symposium on the topic "Cold soils in a changing world and their ecological significance. The Co-Chairs are E.-M. Pfeiffer

(Germany) and M. Balks (New Zealand) and the keynote speaker will be J. Bockheim (USA). The symposium is focused on the sensitive permafrost regions and will be an excellent platform to discuss the newest results on permafrost soil related research and their ecological importance. It will bring together all necessary disciplines concerning the understanding of the processes in cold soils of both hemispheres in a changing world.

### 3. COASTAL AND OFFSHORE PERMAFROST DYNAMICS (COPD)

Co-chairs

George Cherkashov, Russia (cherkashov@mail.ru)

Paul Overduin, Germany (paul.overduin@awi.de)

Working Group history and mission

At the Ninth International Conference on Permafrost, the WG on Coastal and Offshore Permafrost reached the end of its 5-year duration. A proposal was made to the IPA Executive Committee to support the establishment of a new WG on Coastal and Offshore Permafrost Dynamics. In a series of meetings the following objectives were agreed upon:

- To support the development and production of maps of subsea permafrost
- To coordinate an Arctic coastal erosion modelling effort
- To support the Remote Sensing Task Force with the collection of standardized remote sensing data products for coastal monitoring sites and the development of new tools for the detection of permafrost in the coastal zone including historical shoreline positions
- To support the establishment of coastal observatories with development of standard operating procedures for permafrost-relevant observational parameters

Summary of activities

Coastal and offshore permafrost investigations were carried out on the following directions:

- Coastal environmental studies.
- Measurement of permafrost temperature conditions in transition zone.
- Studies of composition, cryogenic structure and properties of permafrost at the Arctic key sites.
- GIS mapping of the permafrost distribution in subsea environment and within adjacent continental areas.
- Outreach program for young permafrost researchers.

Numerous member of the COPD WG presented at a combined Canadian and European space agency workshop on the Arctic coast in Nov. 2009 in St. John's, Canada, which will lead to calls for joint proposals on both sides of the Atlantic. Special sessions on arctic coasts and/or land-ocean interactions were convened at the Arctic Science Summit Week in Bergen, Norway, at the 2009 EGU meeting in Vienna, Austria and the 2009 AGU Fall Meeting in San Francisco, USA. The coastal and offshore permafrost group contributed to the State of the Arctic Coast, an ACD activity sponsored by the IASC and LOICZ. An author's meeting in Quebec City in December 2008 helped to lead to assembly of a 0-order draft near the end of 2009. The report is due to be released in a final version in 2011. A second reporting initiative, sponsored by the Arctic Monitoring and

Assessment Programme (AMAP) is entitled SWIPA: Snow, Water, Ice and Permafrost Assessment. Contributions from the COPD WG to sections on permafrost, Arctic coasts and offshore permafrost were composed. A coordination meeting in January 2010 offers an opportunity to synthesis new results with other components of the report, which will be submitted to the Arctic Council in March 2012. Work on the ACD coastal database continues. The Svalbard segments were populated with data, in an effort led by Rune Strand Ødegård, and a manuscript describing the methods, data and data quality of the database will be completed in early 2010. The IPY project ACCOnet: Arctic Circumpolar Coastal Observatory Network continues to amass remotely sensed data for over 40 coastal sites. These data are being made available to researchers within the coastal research community for change detection analysis.

Efforts to compile existing datasets on subsea permafrost state and distribution continue. An atlas of maps (in analog form) on the morphology, geological structure, sea floor temperature and shelf permafrost distribution for the Russia seas has been collected. Digitization of the above mentioned maps, integral analysis of cartographic information as well as descriptive text (legend) for GIS-maps of on- and offshore permafrost distribution in the Western Russian Arctic are in progress. A final product for the Russian sector will be published in 2012. A proposal to coordinate efforts between researchers in Russia and the other Russian nations through exchange and synthesis workshops will be submitted in 2010.

The educational part of the coastal program of the COPD Working Group is being developed further. In the frame of IPY in 2007 and 2008, several field courses for young scientists were carried out in Yamburg, Western Siberia and on the Western Taimyr. These activities were pursued in 2009 and are planned to be continued in 2010.

Upcoming meetings

A land-oceans interactions special session co-organized by the Marine Science Roundtable and ACD will be held at the IPY Oslo Science Conference (Oslo, Norway, June 78-12, 2010).

There will be a meeting of COPD WG members at the Third European Conference on Permafrost (EUCOP III), Longyearbyen, Svalbard, June 13-17.

The Storm Surges Congress, Risk and Management of current and future Storm Surges, 13-17 September, 2010, Hamburg, Germany includes a session on Arctic coasts.

## 4. GLACIERS AND PERMAFROST HAZARDS IN HIGH MOUNTAIN SLOPES

IPA/IACS Co-chair

Andreas Käab, Norway (kaeaeb@geo.uio.no)

IPA Co-chair

Christian Hauck, Switzerland (christian.hauck@unifr.ch)

IACS Co-chairs

Jeffrey Kargel, USA (jkargel1054@earthlink.net)

Christian Huggel, Switzerland

(christian.huggel@geo.uzh.ch)

Statement of Goals:

- To continue disaster database
- To enhance outreach and dissemination including image gallery with explanations, a second special journal issue
- To increase focus on application of geophysics to permafrost hazards (co-chair C. Hauck)
- Increase meetings with other than EGU, ICOP and EUCOP
- Collaboration with other working groups, e.g. IAVCEI/IUGG Commission on Volcano-Ice Interactions
- Improve geographical representation

*Working group mission and history*

The joint working group by IPA and the International Association for the Cryospheric Sciences under IUGG (IACS) on “Glacier and Permafrost Hazards in Mountains” (GAPHAZ) was endorsed by IPA during its 8<sup>th</sup> ICOP in 2003 and its second term approved at NICOP in 2008. Despite of the significant impacts of glacier and permafrost hazards and disasters, and despite of the increasingly urgent need to improve understanding and prevention of glacier and permafrost hazards in high mountains, there was prior to GAPHAZ no collaborative scientific initiative under the auspices of an international scientific lead body focussing on such hazards. The overall GAPHAZ mission is thus to foster knowledge and international collaboration on glacier and permafrost hazards in mountains in order to support their management.

From the working group objectives, special focus is currently on (a) updating and extending the GAPHAZ disaster database, (b) enhancing outreach and dissemination, (c) application of geophysics to permafrost hazards, (d) meetings and sessions, (e) collaboration with other working groups, in particular the IAVCEI/IUGG Commission on Volcano-Ice Interactions, and (f) on improving geographical representation in the working group.

*Initiatives to date and international connections*

Since 2003, GAPHAZ did hold 11 scientific sessions at EGU, EUCOP, NICOP and MOCA-09 with in total over 200 abstracts (oral and poster presentations). It participated in a number of review publications, proceedings, and book chapters, and published a special issue in *Global and Planetary Change*. GAPHAZ developed a database on major permafrost and glacier disasters that is accessible as stand-alone web-solution and as .kml GoogleEarth file. GAPHAZ maintains a webpage ([www.geo.uio.no/remotesensing/gaphaz](http://www.geo.uio.no/remotesensing/gaphaz)) and a member/ mailing list. A number of GAPHAZ members support as co-

editors or scientific advisers scientific journals such as PPP and *The Cryosphere* on glacier and permafrost hazards.

GAPHAZ maintains strong international connections among others with IACS (joint working group), IAVCEI (volcano-ice interactions), EGU (sessions), WGMS (disaster data base), IPA task force on remote sensing.

*Work plan*

- Maintenance of the working group homepage.
- Maintenance of a list of scientists and organizations active in the field of glacier and permafrost hazards in high mountains. Improve geographical representation.
- Sessions on glacier and permafrost hazards, and special sessions within international scientific conferences (e.g. EUCOP, EGU).
- International workshop on glacier and permafrost hazards (Vienna, November 2009)
- Maintenance and update of general GAPHAZ recommendations related to glacier and permafrost hazards.
- Maintenance and update of the web-based database of glacier- and permafrost-related disasters. Linkage of the data base to the Standing Committee on Data, Information and Communication products.
- Support fundraising by individual members through letters of support.
- Intensify collaboration with other working groups or institutions in the field (e.g. IAVCEI/IUGG commission on volcano-ice interactions)
- Further facilitate communication between IPA and IACS (and IGS) towards a long-term cooperative agreement.

*Next meetings*

- GAPHAZ session(s) at EGU, 2-7 May 2010, Vienna

*New directions*

The Nov 2009 workshop resulted in a number of new GAPHAZ products and results, and did lead to further specification and extension of the GAPHAZ objectives. Details on the workshop outputs are provided in page 39.

## 5. ISOTOPES AND GEOCHEMISTRY OF PERMAFROST

Co-chairs

Hanno Meyer, Germany (hanno.meyer@awi.de)

Ron Sletten, USA (sletten@u.washington.edu)

Statement of goals:

- Prepare special PPP volume of contributed papers on the use of isotopes in permafrost research (2010)

The main objectives of the working group „Isotopes and Geochemistry of Permafrost“ are to promote application of isotope and geochemical methods in permafrost research and bring together persons and groups working actively in this kind of research, to facilitate communication between individuals and with other programs involving isotope and geochemical investigations in polar regions.

During the NICOP Conference 2008 in Fairbanks, Alaska, the co-chairs. asked for a two-year extension to finish the work of the WG with a special volume on „Isotopes and Geochemistry of Permafrost“ in *Permafrost and Periglacial Processes* (planned for the first issue 2010). This two-year extension was approved during the IPA Concil meeting. WG members were motivated



during the NICOP 2008 WG meeting to demonstrate interest and to submit an abstract for the special volume until July 2008. We received more than 15 subjects in the broad context of isotope research in permafrost with internationally diverse representation. We decided that the focus of the special issue would be on water isotopes in the hydrological cycle and PPP's editor-in-chief, A. Lewkowicz, was informed about the that decision. The first eight manuscripts were received by the co-chairs and pre-reviewed in the first half of 2009 and are, presently, either submitted/under review in PPP or will be revised according to our suggestions for improvement before final submission. We are, therefore, optimistic that the Special Issue on „Isotopes and Geochemistry of Permafrost“ can be published in spring 2010 as a final product of the WG.

## 6. PERIGLACIAL LANDFORMS, PROCESSES AND CLIMATE

Co-chairs

- Julian Murton, U.K. (J.B.Murton@sussex.ac.uk)
- Norikazu Matsuoka, Japan (matsuoka@atm.geo.tsukuba.ac.jp)
- Ole Humlum, Norway (Ole.Humlum@geo.uio.no)

Webmaster

Statement of goals:

- Climate Report - To produce a report on the climatic significance of periglacial features. This will update Washburn's 1980 paper in *Earth Science Reviews* and provide a state-of-the-art review for researchers working on climate change and palaeoenvironmental reconstruction.
- Methods Handbook - To produce and update regularly a handbook on the methods of monitoring of periglacial processes in order to standardize field procedures.
- Website - Set up and maintain a website to promote periglacial geomorphology

*Meetings, field trips (2008-2012):*

- 19–24 April 2009: Session GM5.1 on Periglacial Processes, Landforms and Environments, EGU General Assembly, Vienna, Austria. Convenor: Murton; Co-Convenor: H. H. Christiansen
- 25 September 2009: Symposium to celebrate the research contribution of Professor Charles Harris, University of Caen / CNRS, Caen, France.
- 2–7 May 2010: EGU General Assembly Vienna sessions on:
  - Periglacial geomorphology (Convenor Murton; Co-Convenor: H. H. Christiansen)
  - Periglacial erosion of mountains: integrating short- and long-term observations (Convenor T.C. Hales; Co-Convenor: Murton)
- 14–17 June 2010: Session of the Third European Conference on Permafrost (EUCOP III), UNIS, Svalbard. Includes a symposium on the Climatic significance of periglacial features (Convenor: Murton) and a field presentations on periglacial research will be given by several scientists working in the area: Matsuoka, Harris, Lewkowicz, Humlum, Christiansen, and students and several engineers. Discussion of climate report (goal 1) and planning of review paper.
- Summer: Session on Periglacial geomorphology and

engineering geology, Annual Meeting of the British Society of Geomorphology, University of Sussex (Convenor: Murton).

- April 2011: session on periglacial geomorphology at EGU General Assembly, Vienna
- April 2012: session on periglacial geomorphology at EGU General Assembly, Vienna

*Web page address:*

<http://www.periglacial.org>

*Liaison with international organisations:*

IGU as co-convenor of Commission on Cold Region Environments (CRE).

*Proposed journal special issue*

2010–11 Special issue of Permafrost & Periglacial Processes dedicated to Professor Charles Harris (8 papers currently proposed).

## 7. PERMAFROST AND CLIMATE

Co-chairs

Oleg A. Anisimov, Russia (oleg@oa7661.spb.edu)  
Frederick E. Nelson, USA (fnelson@udel.edu)

Statement of goals:

- To develop and promote diverse approaches to modeling and mapping of permafrost, including both probabilistic and deterministic methodologies
- To emphasize integrative mapping/modeling, involving the dynamics of periglacial features and carbon fluxes from thawing permafrost
- Coordinate, in conjunction with the Standing Committee on Data Information and Communication, preparation of a biannual assessment of the state of permafrost

The WG members (Anisimov, Romanovsky, Nelson, Shiklomanov) contributed to the SWIPA (Snow, Water, Ice and Permafrost in the Arctic) assessment report, chapter on permafrost. The chapter writing team met at the University of Delaware in May 2009 and discussed the recent advances in modeling permafrost dynamics under changing climatic conditions, one of which is the use of stochastic models capable of addressing the problem on a probabilistic basis. This methodology developed in the early 2000s was tested in a pilot study at the Kuparuk river basin but had not been used at continental scales. A probabilistic permafrost projection for the mid 21<sup>st</sup> century was constructed for Russia and used improved datasets on climatic, soil, snow and vegetation data. The results of this study have been included in the ongoing SWIPA report and presented in detail in the paper published in "Earth Cryosphere", v.III 2009 (in Russian).

WG co-chair Anisimov contributed to the European project PALSALARM. One of the project goals is to study the behavior of Scandinavian palsas under changing climatic conditions and to predict their future distribution. The dedicated workshop was organized in October 2008 at the Abisko research station in Northern Sweden.

Impacts of climate change on Russian permafrost were the focus of a joint UK-Russian project launched in 2009 between the UK Met.Office and Roshydromet. Scientific team at the State Hydrological institute in St.Petersburg (Anisimov and three younger scientists) together with the scientists from the climate impact group of the Hadley Center (R.

Dunkers, A. Wildshire, J. Gornal) prepared a comprehensive literature review, which will be published as the UK Foreign and Commonwealth Office (FCO) report by the end of 2009. The focus is on predictions of the state of permafrost under changing climatic and environmental (vegetation) factors with particular emphasis on the implications for the carbon cycle.

Another report addressing the broad spectrum of environmental and socio-economical impacts of thawing permafrost in Russia was prepared on request from Greenpeace. The writing team consists of nine scientists from Russia, Norway and the USA, including several IPA WG members (Anisimov, Shiklomanov). The report was published as a Greenpeace document in Russian and in English and was presented at the COP15 Conference in Copenhagen in December 2009. The summary was used in September 2009 as a “guidebook” in a media tour, where journalists from several countries guided by a scientific consultant visited the Yamal area to study the impacts of changing climate.

Anisimov and two younger collaborators (V. Kokorev, J. Strelchenko) continued the work on developing dedicated web-portal on modeling climate change impacts on permafrost (<http://www.permafrost.su>). In 2009 this project was supported by the grant of the German Otto-Schmidt Laboratory in St. Petersburg. The web site in two languages (Russian, English) presents various information on permafrost models and predictive results obtained under various climatic scenarios. It supplements recently renewed IPA permafrost site (<http://ipa-permafrost.org>), and potentially addresses large auditorium of Russian speaking people interested in permafrost who have difficulties using the English-based web portals.

Anisimov participated in the Scoping meeting of the Fifth IPCC report that took place in July 2009 in Venice. The ongoing report will update the results of the 2007 volumes. Currently the structure of the report is under development; however it is already clear that impacts on permafrost will be an important feature for the writing team and new permafrost projections based on probabilistic methodology will serve as a basis for such kind of assessment.

Presentations on climate-permafrost modeling have been made at several national and international meetings and conferences, including the 2009 EGU meeting (April, Vienna), the International conference “Climate change impacts in the Barents region” (September, Vadso), and at the conference “Summary of the IPY results” (October, Sochi).

#### *Mapping and Modelling Subgroup (Modelling Spatial Dynamics of Permafrost at Diverse Scales)*

Co-Chairs:

Stephan Gruber, Switzerland ([stgruber@geo.unizh.ch](mailto:stgruber@geo.unizh.ch))

Nikolay Shiklomanov, USA ([shiklom@udel.edu](mailto:shiklom@udel.edu))

Statement of Goals:

- Develop and evaluate theoretical and semantic aspects of modeling permafrost distribution under climatic change
- Emphasize scale (space, time, depth) and the treatment of sub-scale effects in models, model validation and map products, both in lowland and mountain environments

This sub-group was founded during the Ninth International Conference on Permafrost 2008 in Fairbanks, Alaska. The initiative is based on the fact that issues of uncertainty, scale

and validation are becoming more and more important in the light of increasing scientific interest and societal relevance of permafrost research.

This sub-group has the mission to promote collaboration and research concerning those topics, and to provide a review and outlook regarding important research questions, technical challenges and needs for coordinated action.

This sub-group has the objective to develop and evaluate theoretical and semantic aspects of modeling permafrost distribution under climatic change with emphasis on scale (space, time, depth) and the treatment of sub-scale effects in models, model validation and map products, both in lowland and mountain environments.

A website has been set up ([http://www.geo.unizh.ch/~stgruber/pf\\_scale.html](http://www.geo.unizh.ch/~stgruber/pf_scale.html)) and the events mentioned under item 5 have been organized and prepared. A series of meetings and events are planned in 2010:

- A twinned session at AGU 2009 and EGU 2010 on «Modeling the Spatial Dynamics of Permafrost and Seasonally Frozen Ground at Diverse Scales» is convened by members of the sub-group.
- A special Issue of The Cryosphere to be announced shortly before AGU, based on, but not exclusively restricted to the contributions to those sessions.
- The special issue will be bound by a reviewed editorial summarizing current research efforts and identifying new directions and future needs.

This is a rather young sub-group. The scientific sessions at AGU and EGU as well as the special issue are expected to provide a good basis to decide at EUCOP 2010 on the future developments stemming from it.

## 8. PLANETARY PERMAFROST AND ASTROBIOLOGY

Co-chairs:

Dirk Wagner ([dirk.wagner@awi.de](mailto:dirk.wagner@awi.de))

Christopher McKay ([cmckay@arc.nasa.gov](mailto:cmckay@arc.nasa.gov))

Statement of goals:

- To investigate microbial activities and growth rates at in situ conditions (e.g. subzero temperature) in ice and permafrost,
- including development of aseptic drilling techniques and sampling strategies
- To conduct biological experiments in the outer space
- To conduct measurements of long-lived radioisotopes and development of modelling of their radiation in permafrost
- To interpret data obtained by space vehicles with regard to permafrost (e.g. morphology, living conditions, water)

*Main results:*

- Microbial activities and the structure of microbial communities have been studied during several expeditions to northern Canada, Scandinavia and Siberia (partly within the scope of IPY projects). As a result of field work in permafrost environments it has been shown that the organisms are well adapted to their extreme habitat with an abundance and diversity comparable to temperate soil environments. Furthermore, several new species isolated from permafrost-affected soils and sediments has been described.
- Within the framework of the HGF Alliance “Planetary

Evolution and Life” a proposal entitled “Biology and Mars Experiment, BIOMEX” was submitted to the ESA to conduct exposure experiments with various microorganisms including new strains isolated from Arctic and Antarctic permafrost environments on the EXPOSE/ISS facility. The aim of the planned experiment is to get knowledge about stability and degradation levels of space exposed pigments, secondary metabolites and cell surfaces in contact to a terrestrial, lunar and Martian analogue mineral substrate as well as to a Martian adequate atmosphere environment.

- Abundance of the cosmogenic nuclide chlorine-36 ( $^{36}\text{Cl}$ ) was measured together with the chloride ( $\text{Cl}^-$ ) concentration in different horizons of Quaternary permafrost samples collected from various types of ground ice in the northeastern part of Siberia (Blinov et al., *Geochem. Geophys. Geosys.*, in press). The  $^{36}\text{Cl}/\text{Cl}$  in 32 samples ranged in value from  $2.4 \times 10^{-14}$  to  $1.4 \times 10^{-12}$ . The general concordance of the modelled ages with geological expectations and other chronological methods supports the potential power of the proposed dating method.

*Next meetings:*

- The next working group meeting will be organized during the “Third European Conference on Permafrost” on Svalbard in June 2010, where two sessions related to microbiology and permafrost are planned (extraterrestrial permafrost, microbiology in permafrost environments).

## 9. PERMAFROST ENGINEERING

Co-chairs

Richard Fortier, Canada (richard.fortier@ggl.ulaval.ca)

Fujun Niu, China (niufujun@ns.lzb.ac.cn)

Lukas Arenson, Permafrost Young Researchers Network (PYRN) (arenson@igt.baug.ethz.ch)

The PEWG mission is to facilitate the communication and exchange of information in the engineering and scientific professional communities to advance the practice of permafrost engineering. A. Instanes and T. Vinson stepped down as the PEWG Co-Chairs last year during the Ninth International Conference on Permafrost. R. Fortier, F. Niu and L. Arenson are now acting as PEWG Co-Chairs and PYRN Co-Chair respectively.

Statement of Goals:

- To organize a technical session on engineering geophysics for the detection and characterization of thaw sensitive zones in a permafrost environment during the Canadian Conference on Permafrost (2010)
- To identify and advertise an inventory of engineering test sections in a permafrost environment
- To compile guidelines for best engineering practices in a permafrost environment
- To recruit engineers as members of the Permafrost Young Researchers Network (PYRN) engineers

The PEWG Co-Chairs have contacted the organizing committee of the Canadian Conference on Permafrost (CanCOP 6) for the organization of a technical session on engineering geophysics during this conference. The CCOP will be held in mid-September 2010 at Calgary, Alberta, Canada, during the Canadian Geotechnical Conference. R. Fortier, N. Foged and J. Yang will be in charge of this technical session

and solicit papers from scientists and engineers involved in engineering geophysics.

Niu F. and his colleagues are currently working on a report on testing sections of the Qinghai-Tibet Railway and the new-planned Qinghai-Tibet Express Highway in permafrost regions. Over the past 2 years D. Esch has visited and photographed most all of the Alaska DOT permafrost research monitoring sites. He is also working on a status report.

R. Fortier has been invited by the organizing committee of the 8<sup>th</sup> International Symposium on Permafrost Engineering to be held next October 2009 at Xi’an, China, to give a keynote speech on Permafrost degradation and related geological hazards in Northern Quebec, Canada. F. Niu is acting as one of the two general secretaries of this symposium. Richard Fortier will also give at CAREERI a lecture on the impacts of permafrost degradation on a road embankment at Umiujaq in Nunavik (Quebec), Canada. Both PEWG Co-chairs will use this opportunity to discuss about the working group activities.

G. Doré, professor in civil engineering at Université Laval, has submitted a proposal for the 15<sup>th</sup> International Conference on Cold Regions Engineering to be held at Québec, Québec, Canada, on August 2011. A technical session on engineering test sections in a permafrost environment will be organized during this conference.

R. Fortier is preparing a workshop on risk assessment and geohazard evaluation of permafrost degradation: the case study of the municipal development of the Inuit community of Salluit, Northern Quebec, Canada, for the students of the Institute of Northern Engineering (INE) / Alaska University Transportation Center (AUTC), University of Alaska Fairbanks (UAF), and the engineers of the Alaska Department of Transportation (ADOT). This workshop will be held at the UAF in winter 2010. Niu F. has a project in progress on the geohazard assessment under the climate warming and engineering activities in permafrost regions of the Qinghai-Tibet Plateau. Some Ph.D students involved in this project might follow the workshop prepared by R. Fortier. These are initiatives to reach one the objectives of the PEWG subgroup on Engineering Geology for Development in Permafrost Regions.

The working group is actively involved in the following meetings:

- 14<sup>th</sup> International Conference on Cold Regions Engineering (30/08/2009 – 02/09/2009, Duluth).
- Eighth International Symposium on Permafrost Engineering (14/10/2009 – 17/10/2009).
- International Workshop on Glacier and Permafrost Hazards (10/11/2009 – 13/11/2009).
- Third European Conference on Permafrost (13/06/2010 – 17/06/2010, Longyearbyen).
- Canadian Conference on Permafrost (10/2010, Calgary, Alberta, Canada).

*Subgroup on Engineering Geology for Development in Permafrost Regions*

Chair

Dmitry Sergueev (sergueevdo@mail.ru)

K. Flaate, J. Brown and F. Baynes proposed the way of cooperation between the International Association for Engineering Geology and the Environment (IAEG) and IPA

(Ninth International Conference on Permafrost Fairbanks, Alaska USA June 29 – July 3, 2008). The discussion between IAEG and IPA has taken place by correspondence and a meeting in Vail, Colorado, June 7, 2007. The IAEG Council meeting held in Vail, Colorado, June 3, 2007 decided to initiate a commission C-21 that now has a title: “Engineering Geology for Development in Permafrost Regions”.

Statement of goals:

- Develop new methodologies for risk assessment and geohazard evaluation of permafrost degradation in the context of climate warming integrating a probabilistic analysis in risk assessment and mapping of permafrost instability (with IAEG Commission 21)
- Recommend legends to reflect the permafrost condition parameters at different map scales
- Prepare illustrated examples of successful examples for the use of permafrost research in engineering geology practice

The principal initiative of this subgroup is to contemplate the area of collaboration between IPA and IAEG in common approach to estimating the environmental and engineering risk of land-use. Both associations agreed to join efforts in investigation methods description.

Subgroup participants use the “working method” plan to reach the principal goal “to develop new methodologies for risk assessment and geohazard evaluation in permafrost regions”. The national representatives prepare national reviews and collect examples of risk assessment and geohazard evaluation in permafrost regions. The corresponded report was presented at International Conference “Georisk-2009” (Moscow, May 2009) and some communications will be presented at 7<sup>th</sup> Asian Regional Conference of IAEG, Chengdu, China, 9-11 September 2009.

Also we plan document new methodologies and guidelines for permafrost mapping related to engineering geology goals, develop and maintain a dedicated area within the IAEG web site, and participate in preparation of the next version of CAPS CD's in part of publication of available maps' legends and methods review of geological risk estimation.

The subgroup was or is to be involved in the following meetings

- 14<sup>th</sup> Conference on Cold Regions Engineering (30.08.2009 - 02.09.2009, Duluth).
- 7<sup>th</sup> Asian Regional Conference of IAEG, Chengdu, China, 9-11 September 2009.
- Eighth International Symposium On Permafrost Engineering (14.10.2009 - 17.10.2009).
- International Workshop on Glacier and Permafrost Hazards (10.11.2009 - 13.11.2009).
- Third European Conference on Permafrost (13.06.2010 - 17.06.2010, Longyearbyen).
- 11<sup>th</sup> Congress of the International Association for Engineering Geology and the Environment (IAEG), in Auckland (New Zealand), 2010.

The subgroup now wants to focus on the following initiatives

- Methods for risk assessment and geohazards evaluation in relation with permafrost change.
- Guidelines for permafrost mapping in relation with engineering geology goals.

# TASK FORCES

## I. REMOTE SENSING

Co-chairs:

Guido Grosse, U.S.A. (ggrosse@gi.alaska.edu)

Claude Duguay, Canada (crduyguay@uwaterloo.ca)

Statement of Goals:

- Generate a database with key information on study sites where change in permafrost was or is investigated using remote sensing methods
- Synthesize a peer-reviewed special journal issue on current developments in remote sensing of permafrost environments
- Promote the use of airborne and spaceborne sensors in detection and mapping of permafrost properties and periglacial processes in the light of ongoing climate change
- Establish linkages to major space and funding agencies (NASA, NSF, ESA, CSA, JAXA, DLR) and other entities (STG, WMO) to facilitate remote sensing image acquisitions over important permafrost key study sites to be distributed to individual users

The taskforce held two meetings in 2008 and organized sessions during larger conferences:

- 1<sup>st</sup> Meeting (Founding of TF): NICOP June 2008, Fairbanks, USA
- 2<sup>nd</sup> Meeting: AGU Fall Meeting December 2008, San Francisco, USA
- NICOP June 2008 (Oral session: Remote Sensing in Permafrost)
- AGU Fall Meeting December 2008 (Oral session C13B: Remote Sensing of the Cryosphere III: Changes in Terrestrial Permafrost)
- AGU Fall Meeting December 2008 (Poster session C31E: Remote Sensing of the Cryosphere VI)
- AGU Fall Meeting December 2009 (Session C04: The Changing Cryosphere and Hydrosphere through Remote Sensing, Geodesy and Modeling)
- The taskforce is also planning the organization of a remote sensing session at the 3rd European Permafrost Conference in June 2010 on Svalbard.

The taskforce has been involved in a series of other activities:

- The taskforce started generating a database with key information on study sites where change in permafrost was or is investigated using remote sensing methods. A questionnaire and data entry form was developed, sent to members of the permafrost community, and was posted on the TF and the PYRN websites
- Support for coordinating the involvement of permafrost field researchers and modelers as user groups in the European Space Agency Project ‘Data User Element Permafrost’ launched in 2009
- The taskforce will start contacting Journal Editors in Fall 2009 to organize a special issue on remote sensing of permafrost
- A website was created where TF goals, activities, and newsworthy items are posted regularly
- A 1st Newsletter was sent out in July 2009 and posted on PYRN website
- A webpage was created at: <http://permafrostwatch.org/>

news/ipa\_taskforce\_remotesensing.html

Permafrost dynamics during periods of global change are increasingly recognized as an important factor in biogeochemical cycling, topographic and hydrological change, and in northern engineering and infrastructure development. The possible rapid changes in permafrost during climate warming or after surface disturbance can be monitored directly with a broad variety of remote sensing techniques. Of highest interest for the permafrost and climate change research community are quantitative analyses of change, matter and energy fluxes, and the physical properties of permafrost.

The taskforce requests and encourages the permafrost community to submit information on past and ongoing studies that generated data on change in permafrost as observed with remote sensing methods, including ground-based remote sensing techniques. The main goal is to show a more coherent picture of observed changes in permafrost, get an overview of the remote sensing methods currently used, and explore the focus of interest in our research community. Relevant observations include, but are not limited to, the thermal erosion and abrasion of coasts, lake shores, and stream banks, thermokarst subsidence, thermo-erosion, frost heave and thaw subsidence, sink hole formation, thaw slumping, solifluction, and rock glacier movement.

The information collected will be used for outreach activities of the IPA and the IPA Task Force on Remote Sensing, and likely will get wide attention by researchers outside the permafrost science community and by the media. Data from this questionnaire will be entered in a database and submitted to the IPA Standing Committee on Data, Information, and Communication for future publication on the next Circumpolar Active Layer-Permafrost System (CAPS) – DVD. The dataset will also enter the database of the National Snow and Ice Data Center (NSIDC) in Boulder, Colorado, USA. The taskforce eventually envisions approaching space and funding agencies action to acquire further high-quality imagery over selected key sites contained in this new database. If successful, imagery will then be distributed to the local PIs to continue change detection studies and to gather highly important information on changing permafrost landscapes.

## 2. SUBGLACIAL PERMAFROST

Chair:

Julian Murton, U.K. (J.B.Murton@sussex.ac.uk)

Statement of Goal:

- To promote interdisciplinary research collaboration between permafrost scientists, glacial geologists, glaciologists and Quaternary scientists – all sharing a common interest in the coupling between Quaternary ice sheets and permafrost beneath their margins

Meetings, field trips (2008-2012):

The taskforce was involved or plans to be involved in the following meetings

- 22–24 May 2009 Workshop on Glaciotectonic deformation of frozen sand intraclasts within glaciotectonically deformed Pleistocene sediments, West Runton, north Norfolk coast, UK. R. Waller (Keele University), J. Lee & E. Phillips (British Geological Survey), C. Whiteman (Brighton University) & J. Murton (Sussex University).
- 20–27 July 2011 - Session on Subglacial Permafrost at INQUA Congress, Bern, Switzerland
- September 2011 - Combined workshop and field meeting on Glaciotectonics, in which subglacial permafrost will be a key area for discussion. The meeting will probably comprise 2 days of days of lectures and talks, followed by 3 days of field work and will be based on the North Norfolk coast.

The taskforce has also established active liaison with the the INQUA Commission on Terrestrial Processes, Deposits and History (TERPRO).

# NEWS FROM MEMBERS

Members are encouraged to submit periodic updates of activities for posting on the IPA website (<http://ipa-permafrost.org>).

## ARGENTINA (AND SOUTH AMERICAN PARTNERS)

A.-L. Ahumada, G. Ibáñez Palacios and S. Páez (Fundación Miguel Lillo, Tucumán) continue their research of cryogenic environments and rockglaciers of the Sierra de Aconquija (Province of Tucumán) and Sierra de Santa Victoria (Provinces of Salta and Jujuy). They have registered 256 active and 67 inactive rockglaciers at Aconquija and located their limit of activity at 4300 m a.s.l. approximately. The research group has also started investigations at the Nevados de Cachi (Province of Jujuy). A.-L. Ahumada was invited to hold a lecture on global warming at the Academy of Science in Buenos Aires. Together with other experts (e.g. D. Trombotto), she worked as advisor for the elaboration of an Argentine Law for the protection of glaciers and rock glaciers.

A. Brenning and X. Bodin (University of Waterloo, Canada) continued the geodetic monitoring of rock glaciers and thermokarst-affected massive ice in the Andes of Santiago/Chile in 2008/09. In addition to differential GPS measurements initiated in 2004, they used terrestrial laser scanning (TLS) on rockglaciers for the first time in the Andes. Additionally, ground surface temperatures are being monitored at a wide range of locations for statistical analysis.



*Peteroa Volcano, Argentina / Chile  
(Photograph provided by Dario Trombotto)*

L. Ruiz (IANIGLA) has successfully applied the BTS method to detect permafrost in the Valley of Silence near Lake Caradoc in the north-west of the province of Chubut. He thereby recovered the input information necessary for a model simulation of permafrost extent in the vicinity of the Lake District in the Humid Andes. The identified mountain permafrost was characterized as a type of low altitude patchy (island) permafrost (>1700 m a.s.l.) with surface radiation values typically lower than 14 Mj/m<sup>2</sup>/d. M. Castro (Universidad

Nacional de Cuyo, Mendoza) has registered 95 rockglaciers in the Cordillera del Tigre (Province of Mendoza).

In 2009, D. Trombotto (IANIGLA) and P. Penas (CNEA, Buenos Aires) with the support of the ICES (Malargüe) made an inspection flight over the active volcano Peteroa for a thermal analysis of the caldera which is ice covered and features exposures with permafrost and subterranean glacier ice.

Dario Trombotto ([dtrombot@lab.cricyt.edu.ar](mailto:dtrombot@lab.cricyt.edu.ar))

## AUSTRIA

Permafrost research in Austria in 2009 was carried out by an increasing number of experienced and younger scientists. The University of Innsbruck group of K. Krainer in cooperation with the Vienna University of Technology (E. Brückl, H. Hausmann), the Central Institute for Meteorology and Geodynamics in Salzburg/ZAMG Salzburg (M. Staudinger, C. Riedl) and the Geological Survey of Austria (A. Römer) continued working on the project *Permafrost in Austria*. At the study area Krummgampental, Kaunertal (Ötztal Alps) permafrost mapping was continued on unconsolidated sediments (rock glacier, moraines, talus slopes) using a 12 channel seismic recording system with continuous recording modus. Interpretations of velocity-depth functions from 1D-diving wave tomography, 2D seismic refraction analyses and BTS-temperatures were evaluated for permafrost detection. A structural investigation was conducted with GPR (low frequency antennas/15&35MHz). At the study area Sonnblick the observation of P- and S-wave velocity field variations and seismic tomography using 15 borehole geophones was applied.

ZAMG Salzburg also continued working on PermaNET ([www.permanet-alpinespace.eu](http://www.permanet-alpinespace.eu)). For 2009 a laser scan of the north face of Sonnblick was carried out which will be repeated in the following years. For the 3D modelling of the permafrost distribution on Sonnblick long term climate data, present borehole temperature data (20 m) and ground surface measurements were collected and corrected. ZAMG Vienna (W. Schöner) continued working on the project PERSON as another part of the larger permafrost monitoring programme in the Sonnblick region.



*Collection of ground surface temperature data and marking the sensor location in the Sonnblick north face at 3100 m a.s.l.  
(Photograph provided by Gerhard Schauer)*

The University of Salzburg group (L. Schrott, J.-Ch. Otto, B. Ebohon) continued working on *permalp.at* ([www.permalp.at](http://www.permalp.at); including a Web GIS). At several test sites (Glorer Hütte, Kitzsteinhorn, Gradental, Obersulzbachtal) new data have been gathered by field geophysics (ERT, GPR), ground temperature dataloggers and BTS-measurements.

The University of Innsbruck group of J. Stötter carries out permafrost research within *PermaNET*, *ALS-X* (Combination and Evaluation of Airborne Laserscanning and TerraSAR-X Data in Glaciology and Hydrology) and *C4AUSTRIA* (Climate Change Consequences for the Cryosphere) projects. All projects apply airborne laser scanning/ALS data and relevant tools. Preliminary results show that the high spatial resolution and the precision of the ALS data facilitate the quantification of permafrost degradation.

The Graz group consisting of the University of Graz (A. Kellerer-Pirklbauer, G.K. Lieb), Graz University of Technology (M. Avian, V. Kaufmann), and Joanneum Research (A. Bauer), continued working on *ALPCHANGE* (extended to November 2009; [www.alpchange.at](http://www.alpchange.at)) and *PermaNET* spatially focussing on study areas in the Hohe Tauern and Niedere Tauern Ranges in Austria. In 2006, comprehensive permafrost monitoring networks were installed at six study areas within *ALPCHANGE* (see previous Frozen Ground issues). All these monitoring activities were continued and extended within *PermaNET* in 2009. Local scale activities were exemplarily the continuation of the annual geodetic measurements on the Dösen, Hinteres Langtalkar and Weissenkar rock glaciers, field mapping, 2D-geolectric measurements (in cooperation with J. Götz, University of Salzburg) and BTS measurements at different sites. The resurveying by terrestrial laser scanning/TLS of the front of the Hinteres Langtalkar rock glacier (since 2000) as well as most of its lower two-third as seen from a higher elevated scanner position (first time this year) was carried out by the new TLS system Riegl LMS-Z620. Airborne laser scanning/ALS was carried out in September 2009 at the Pasterze area and the Central Schober Mountains. Finally, within a bilateral project A. Kellerer-Pirklbauer and M. Avian joined colleagues from the Universidad Complutense, Madrid, Spain (D. Palacios, L. M. Tanarro, J. Marcos) for joint fieldwork in the Sierra de Gredos and Sierra Nevada.



*Joint fieldwork of Austrian permafrost researcher (A. Kellerer-Pirklbauer, M. Avian) with Spanish colleagues (D. Palacios, L. M. Tanarro) at the southern most active rock glacier and permafrost site of Europe, at Corral de Veleta in the Sierra Nevada, Spain.  
(Photograph provided by Andreas Kellerer-Pirklbauer)*

Finally we want to report on a new project that should be approved by the end of 2009. *PERMAFROST* – Austrian Permafrost Research Initiative is a joint project by four different Austrian permafrost research groups (Graz, Salzburg, 2 x Innsbruck) and a first step in order to establish a permafrost monitoring program in Austria. This project will be funded by the Austrian Academy of Sciences.

Andreas Kellerer-Pirklbauer and Gerhard Karl Lieb  
([andreas.kellerer@uni-graz.at](mailto:andreas.kellerer@uni-graz.at))

## CANADA

The Canadian permafrost community has been busy this past year with IPY projects and other activities including organization of the Sixth Canadian Permafrost Conference. This report presents some highlights of ongoing research and other activities.

*Thermal State of Permafrost (TSP-Canada) – A Canadian Contribution to the International Polar Year – S. Smith, A. Lewkowicz and C. Burn*

This collaborative project led by S. Smith (Geological Survey of Canada), A. Lewkowicz (University of Ottawa) and C. Burn (Carleton University) has made significant progress on its objectives to establish new permafrost monitoring sites to address gaps in the existing long-term monitoring network. As reported last year over 80 new boreholes were added. In 2009 additional sites were established in Nunavut communities, along an elevation transect at Eureka and in the Yukon with the most recent borehole drilled at Mt. McIntyre. Permafrost thermal data have been collected for the IPY period (2007-2009) from most new sites as well as the long-term sites. These data are currently being compiled to produce a ‘snapshot’ of ground thermal conditions that will provide an improved baseline against which to measure change. The Canadian snapshot database will contribute to the larger international database. The Canadian team will be active in preparation of a special issue of *Permafrost and Periglacial Processes* that will present initial IPY results. Canadians and their international colleagues met in October 2009 in Ottawa to develop the special issue. The snapshot database and the special journal issue will be disseminated at the IPY early science conference in June 2010.

*Permafrost and Climate Change, Herschel Island – C. Burn*

A long-term study of permafrost response to climate change on Herschel Island, Yukon Territory has recently been completed. Research results contribute to the IPY project and were presented in a recent paper published in the *Journal of Geophysical Research* by C. Burn and Y. Zhang of Carleton University. Using a recent ground temperature profile, climate records and modelling, Burn and Zhang determined that mean annual temperatures at the top of permafrost and 20 m depth increased by 2.6 and 1.9°C respectively over the last century. An interesting aspect of the Herschel Island study is that the scientists were able to reconstruct climate conditions 100 years ago from the records kept by the missionaries and whalers who lived there at the turn of the 20<sup>th</sup> century. The whalers, especially H.H. Bodfish, described snow conditions at Herschel, and they are much the same as today over much of

the windswept island, i.e. a very thin layer of snow throughout winter. The missionaries, especially I.O. Stringer, kept weather records on behalf of Canada's Dominion Observatory. These data enabled a precise documentation of the change in conditions that has occurred in the 20<sup>th</sup> century in Canada's western Arctic.

*Special Issue of Permafrost and Periglacial Processes on the Mackenzie Delta – C. Burn and S. Kokelj, editors*

A special issue of Permafrost and Periglacial Processes, edited by C. Burn (Carleton) and S. Kokelj (Department of Indian and Northern Affairs), containing a collection of papers on permafrost in the Mackenzie Delta and adjacent regions was released in June 2009. Topics investigated include cryostratigraphy and its relationship to Quaternary history, trends in active layer thickness and ground temperatures across treeline, the development of retrogressive thaw slumps and their influence on lake water quality, and the potential impact of climatically induced thermokarst on terrain stability. Much of the research presented is very relevant to planned infrastructure projects including the proposed Mackenzie Gas Project.

Highlights of the PPP issue include maps of ground temperatures in the Mackenzie Delta area. This is the first regional comparison of ground temperature conditions over a period of about 40 years. Included were conditions over the region collected in the last three years and contrasted with data presented by J.R. Mackay from the 1970s. The PPP issue also contains the longest record of active layer thickness variation published so far, with data collected at Illisarvik, 1983-2008. This record, summarizing changes at 12 sites on a hillslope transect shows clear thickening of the active layer at a tundra site during that period.

*Enhancement of the Permafrost Monitoring Network in the Mackenzie Corridor – S. Smith*

Through support received from the Northern Energy Development Initiative, the Geological Survey of Canada (GSC) undertook to address gaps in its permafrost thermal monitoring network in the Mackenzie Corridor and to collect baseline environmental information that is essential for planning northern energy development and the assessment of associated environmental impacts. Over 50 new monitoring sites were established throughout the corridor between 2005 and 2008. Collaboration with the Department of Indian and Northern Affairs (Kokelj) facilitated the installation of temperature cables in the Mackenzie Delta region. Permafrost thermal data have now been collected from all new installations with a two year record available for most sites. The initial data have been presented in GSC publications including a database product published as GSC Open File 6041 that includes thermal and geotechnical data for new field sites established in the central and southern Mackenzie Valley. An important achievement was the collection of new information on ground thermal conditions in areas (such as the region north of Norman Wells) where very little recent information existed. Data from the new sites and the existing long-term monitoring sites have facilitated an updated characterization of ground thermal conditions throughout the corridor providing a baseline against which change can be measured. Data are

being generated that are essential for planning development within the region. In addition the enhanced network will be an important contribution to environmental monitoring and management programs associated with future development projects in the region.

*2008 Roger Brown Award Recipient, Margo Burgess*

Margo Burgess of the Geological Survey of Canada was presented with the Roger J.E. Brown Award at the 2008 Annual Canadian Geotechnical Society Meeting. The Roger Brown Award is presented by the Cold Regions Geotechnology Division of the Canadian Geotechnical Society and honours excellence in the field of permafrost science and engineering. Margo was recognized for her achievements as a geoscientist over her 30 year career at the Geological Survey of Canada. Highlights of her work include the monitoring of the response of the ground thermal regime and terrain stability to natural and anthropogenic disturbances and the compilation of permafrost and geotechnical databases. She has published extensively, with many publications on the performance of the Norman Wells pipeline including its response to geotechnical issues such as uplift buckling of pipelines, and creep of thawing warm permafrost slopes. The results of her research related to the Norman Wells pipeline have been important not only to the ongoing maintenance and management of the existing pipeline but have also been utilized in the design of the proposed Mackenzie Gas Project and the associated environmental assessment process.

Margo has also been active in the IPA as a member of its Standing Committee on Data, Information and Communication. She also served as a member and secretary of the Canadian National Committee to the International Permafrost Association from 1999 to 2009.

Margo has also contributed her permafrost expertise to international assessments. In 2000, she co-authored the permafrost contribution to Chapter 2 of the Intergovernmental Panel on Climate Change's Third Assessment report. In 2004, she was an expert reviewer for the Arctic Climate Impact Assessment.

The Canadian permafrost community is proud to have Margo as a colleague and congratulate her for receiving this honour.

*Sixth Canadian Permafrost Conference, September 2010*

The CNC-IPA together with the Canadian Geotechnical Society will be hosting a joint Canadian Permafrost Conference and annual Geotechnical Conference in Calgary, September 12-15, 2010. This will be the Sixth Canadian Permafrost Conference and is open to all permafrost-related contributions. The conference website is [geo2010.ca](http://geo2010.ca).

J. Oswell (Naviq Consulting Inc. and Chair, CNC-IPA) has been invited to present the R.M. Hardy Address at the Conference. The R.M. Hardy Keynote Address was established in 1986 to honour this great Canadian teacher and engineer. The address is presented by a well-known, senior CGS member from the area or city where the annual Canadian Geotechnical Conference is held. The topic is usually on a problem or issue of national or local interest. Jim will make a presentation on geotechnical aspects of pipelines in permafrost.



# CanCOP 6

The 6<sup>th</sup> Canadian Conference on Permafrost

September 12-16, 2010  
Calgary, Alberta, Canada

**The Canadian National Committee of the International Permafrost Association (CNC-IPA) invite you to the 6th Canadian Conference on Permafrost. The Conference will be held concurrently with the 63rd Canadian Geotechnical Conference at the Hyatt Regency Hotel in Calgary, Alberta, Canada from September 12-16, 2010.**

## **Permafrost Sessions**

**Mackenzie Delta and Coastal Dynamics - Climate Change and Permafrost - Sumps and Contaminants in Permafrost - Periglacial Processes - Permafrost Geophysics - Slope Stability - Permafrost and Glaciers - Frozen Core Dams and Mining - Infrastructure - General Permafrost Science - Foundation design - Cold Regions Engineering**

## **Short Courses**

**Permafrost Geophysics - Remote Sensing and Permafrost - Introduction to Geosynthetics**

**[www.geo2010.ca](http://www.geo2010.ca)**

### *Proceedings of Canadian Permafrost Conferences Available Online*

The proceedings of the five Canadian Permafrost Conferences (1962-1990) are available for searching and viewing at <http://www.aina.ucalgary.ca/cpc>.

PDF files of the proceedings can be viewed sequentially, and a database containing 187 records describing the papers and other items that appeared in the proceedings can be searched for words in titles and abstracts, broad or detailed subject and geographic categories, authors, and conference numbers. All in this database are also available in the international Arctic & Antarctic Regions database, the main Arctic Science and Technology Information System (ASTIS) database, and relevant ASTIS subset databases.

This initiative was supported by the Canadian National Committee for the International Permafrost Association. The Geological Survey of Canada (Natural Resources Canada) provided support for the digitization of the conference proceedings and funded ASTIS (Arctic Institute of North America, University of Calgary) to index the papers and create the website.

### *Don Hayley to Present Canadian Geotechnical Society Cross Canada Lecture in Spring, 2010*

The Canadian Geotechnical Society has invited Don Hayley, of EBA Engineering Consultants and former member of the Executive Council of IPA, to present a series of lectures to the membership of the Canadian Geotechnical Society.

This lecture tour is a semi-annual program and the lecturer is a notable engineer or geo-scientist of international repute in their respective field. Specific dates for the tour and locations have yet to be finalized.

Sharon Smith ([sharon.smith@nrca-nrcan.gc.ca](mailto:sharon.smith@nrca-nrcan.gc.ca))

## CHINA

Climate warming and enhanced anthropogenic activities have caused, are causing, and will continue to cause degradation of frozen ground in China, resulting in the destabilization of existing cold-regions infrastructures. These problems have been embodied in the field by increasing damage or failure of engineering structures, by frequent outbreaks of construction-induced frost hazards, and by increasing challenges for frozen-ground engineers and scientists. The most urgent issues are probably the retrofitting of existing infrastructures to adapt to changing climate and rising expectations in the level of design of future infrastructures to adapt to changing or changed frozen-ground conditions and upgraded construction standards.

In 2009, permafrost activities in China mainly included projects and programs funded and conducted by the Ministry of Science and Technology (MoST) and National Science Foundation, as well as continuing studies on the Qinghai-Tibet Railway, Highway and Expressway, and the China-Russia Oil Pipeline in Northeastern China.

### *MoST Permafrost Project of the State Key Laboratory of Frozen Soils Engineering (SKLFSE)*

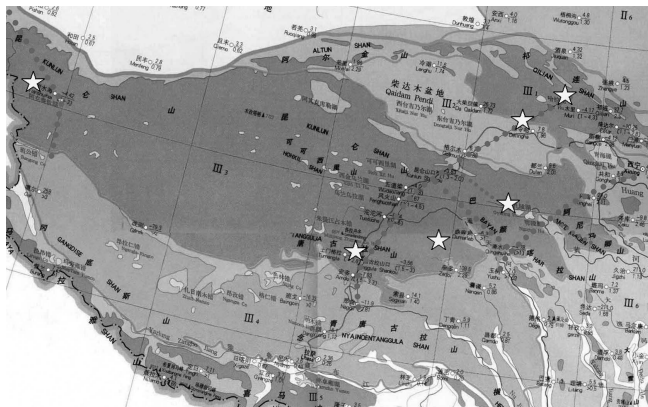
Headed by Professor Wei Ma, this research team will regard the complex climate, frozen-ground, and engineered system as an integrated and interactive system in order to study the physical, mechanical, and chemical processes in frozen-ground foundations and cold regions environments, and their internal interdependence and mutual impacts; to explore the interactions of permafrost and environment, and the complex resultant moisture, thermal and mechanical coupling processes; and to develop and improve the prediction theories and methods on the long-term stability of frozen-ground foundations. Research on the interactions of frozen-ground environments and cold-regions infrastructure can provide more reliable scientific information for the detection of changes and impacts in cold-regions environments, the mitigation of frost hazards, and the control over safety, reliability and long-term stability of state key engineering projects. This project will advance the research on frozen-ground engineering, and help sustain the research in geocryology and cold-regions engineering.

One of the major objectives in this project is to understand and forecast the changes in elevational permafrost. Based on current and future data on the evolution of permafrost, seasonally frozen ground and the active layer processes, the project aims at better understanding the responses of permafrost and active layer to climate change, its interaction with environmental variables, such as vegetation, snow cover, and slopes as well as forecasting changes and their hydrological, ecological, environmental and socio-economical implications.

The study is to be implemented along a planned Qinghai-Tibet Permafrost Ecology Transect (QTPET) which is now

under construction. The QTPET is to start from Nagqu, Tibet south of the Tanggula Mountains to the Hei'he Watershed on the northern flank of the Qilian Mountains (total area of about 1200×600 km). It includes the Sources Area of the 3 Rivers (Yangtze, Yellow and Lancang/Mekong) (SA3R), and the areas along the Qinghai-Tibet engineering corridors from Golmud to Nagqu and from Xi'ning to Yushu, Qidam Basin, and the middle part of the Qilian Mountains. It also includes the Tanggula, Kunlun, Qilian, Bayan Har, Anyemaqen mountain ranges, which are characterized by strong local variations in the zonation of frozen ground, soils, flora and fauna. The northwestern Qingshui'he-Budongquan transect along the Highway S308 extends until the Altyn Tag, a path characterized by declining impacts from monsoonal climate, steep heat-moisture gradients, and dramatic changes in frozen ground conditions and cold regions ecology. The existing Tianshuihai-Akeseqin Permafrost Station along the Highway G219, which was established in 2007 by a joint effort of the University of Heidelberg and the SKLFSE, will be enlarged and extended both in the direction of Yecheng and Ritu near Bangong Co Lake. Akeseqin, with an average elevation of 5000 m a.s.l. and a very harsh environment (very windy year-round and dry (20-27 mm/a)), is believed to be the bottleneck for species migration from southeast to high and west Asia. Long-term (>10-15 years) ecological profiles are also being set up along the SA3R until the Middle Qilian Mountains. There are also several stations built and planned along the Qilian Mountains to form a northwestern profile for permafrost ecology.

These research activities and field monitoring networks may result in about 10 new permafrost, active layer and ecology stations (PALES), with their center being located at the Yushu-Madoi in the SA3R.



Map of the Qinghai-Tibet Permafrost Ecology Transect (QTPET) during its first term (2008-2012).

#### MoST QTP Permafrost Survey Project

With Professor Lin Zhao as the chief scientist and the Cold and Arid Regions Environmental and Engineering Research Institute, Chinese Academy of Sciences as the host, the MoST Basic Research Project "Baseline Survey of Permafrost in the representative areas on the Qinghai-Tibet Plateau" was officially initiated on 24 May 2009. This 5-year, \$2.5-M project aims at collecting and analyzing the existing data on continuous and discontinuous permafrost zones along the main road systems (mainly the Qinghai-Tibet Railway and Highway [QTR/H,

or G109], Qinghai-Kang Highway [QKH, or G214] and Xinjiang-Tibet Highway [XTH, or G219]). It will also perform comprehensive investigations of permafrost conditions along two discrete, longitudinal and altitudinal (Madoi-Qūmaléb-Budongquan-Hoh'Xil-Tianshuihai/ Akeseqin) transects, and comprehensive mapping of five representative areas. Using geophysical sounding, drilling and hand-dug pits, mapping will delineate the present boundaries of permafrost zones, determine the thickness of the active layer, and include data on soils, vegetation, climate and geomorphology. It will also aim at improving the existing observation and monitoring systems, at acquiring basic data of permafrost and cold regions environments, at GIS/RS-assisted mapping of permafrost distribution, and at assessing the *status quo* of permafrost.



Field team from the MoST QTP Permafrost Survey Project in front of the State Key Laboratory of Cryospheric Science (SKLCS), Lanzhou. (Photograph provided by Lin Zhao)

After three months of preparation, the field campaign of this year started on 12 September and was completed on 20 October. The field team consisted of about 40 people and came from the Cold and Arid Regions Environmental and Engineering Research Institute (CAREERI, Lanzhou, Gansu), the Northwest Institute of Plateau Biology (NIPB, Xi'ning, Qinghai), the Institute of Mountain Hazards and Environments (IMHE, Chengdu, Sichuan), and the Lanzhou University. In addition, the project also invited Professor Chien-lu Ping from the College of Agriculture and Natural Resources, University of Alaska Fairbanks, USA and Dr. Tanya O'Neill from the Department of Earth and Ocean Sciences at the University of Waikato, New Zealand to participate in the fieldwork, who provided training for soil investigations for about 10 days.



MoST QTP Permafrost Survey Project field team in Wenquan (Hot spring) Guesthouse, Southern Qinghai Province. (Photograph provided by Lin Zhao)

This field project selected Wenquan along the QKH as the first test/representative area to survey the boundaries continuity (areal extent), and lower limit of permafrost, permafrost active layer thickness, soils, vegetation, climate and geomorphology. It was the first joint action for surveying methods, which will help to standardize surveying methods and records.



*GPR sounding of permafrost near Wenquan. (Photograph provided by Guan Gyue Liu)*

#### *Qinghai-Tibet Expressway Experimental Research Project*

With the gradual implementation of the State Expressway Networks Planning in China, more fast-track, high-grade highways will reach the regions affected by frozen ground. About 30% of the expressways will be in seasonally frozen ground areas, and an additional 2% will cross permafrost terrains. In particular, the Qinghai-Tibet Expressway (QTE) will spread across extensive permafrost areas. Significant increases to the roadway widths are expected as well as increased heat accumulation due to construction standards associated with such constructions. This will lead in turn to more intensive interactions between the engineered infrastructure, the underlying permafrost, and the surrounding environment. New solutions need to be sought to ensure their long-term stability and to comply with safety standards.



*Experimental expressway section at the Beilu'he Permafrost Station in the interior QTP under construction. The four-layer air-ducts were used for stabilizing warm and ice-rich permafrost foundations. (Photograph provided by Qihao Yu)*

In order to provide scientific basis and engineering solutions for the construction of the highway, many research projects have been started. About \$1 million from the SKLFSE budget is invested on the Qinghai-Tibet Expressway experiment and demonstration. The experimental section was based on the experiences from the QTH and QTR, and took

into considerations the requirements and standards for the construction of state expressways, and applied nine different experimental engineering setups to control the structural configurations of the centerline, shoulders, side protective slope, and slope toe/drainage ditches from the perspective of heat convection, conduction and radiation. The experiment began on 1 September, and the road construction and equipment installation were completed by 30 September.

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## DENMARK AND GREENLAND

The Danish contribution for 2009 concentrates on on-going permafrost research presented on the NUUK CLIMATE DAYS 25.-27. August 2009 being a scientific activity related to COP15 – UN climate change conference in Copenhagen. It attracted 145 participants from 16 nations with contributions related to “Changes in the Greenland Cryosphere”.

Mr K. Kleist, prime minister of Greenland, welcomed the Conference. Key note talk was given by Director K. Erb (US National Science Foundation): “Greenland research: Key to global climate research”. A permafrost overview was presented by Professor V. Romanovsky (University of Alaska Fairbanks – UAF): “State and fate of permafrost in the northern hemisphere”. Local climate monitoring was covered by Dr K. H. Svendsen (ASIAQ): “Greenland Survey, ASIAQ, a potential partner in climate change investigations” and by Professor S. Rysgaard (Greenland Climate Research Centre) with examples of long term climate monitoring programs from the research stations at Zackenberg and Nuuk.

On-going permafrost projects covered a half day seminar on “Permafrost and terrestrial hydrology changes” chaired by Professor V. Romanovsky. A series of contributions were presented related to the US NSF supported permafrost project ARC-0612533: “Recent and future permafrost variability, retreat and degradation in Greenland and Alaska – An integrated approach” carried out in co-operation between University of Alaska Fairbanks, Danish Meteorological Institute (DMI), Greenland Survey (ASIAQ) and the Technical University of Denmark (DTU-BYG and ARTEK).

Initially, Dr M. Stendel with coworkers from DMI: J. Hesselbjerg Christensen and G. Adalsgeirsdottir and from UAF: R. Daanen, S. Marchenko and V. Romanovsky presented: “The fate of permafrost in Greenland and Alaska: Results from high-resolution transient climate simulations”. T. Ingeman-Nielsen and N. Foged (ARTEK / DTU-BYG) continued with “Permafrost temperature reanalysis and model projections for Ilulissat, West Greenland”. Afterwards N. Foged with coworkers T. Ingeman-Nielsen and I. Brandt (ASIAQ / DTU-BYG) and K. H. Svendsen (ASIAQ) presented: “Permafrost Risk Zonation in West Greenland” which aims to present recommendations for adaption to the climate change based on risk mapping vulnerability in towns and their surroundings with suggested technical solutions for foundations, roads and other infrastructures. This part of the seminar was closed by PhD-student I. Brandt and co-authors on “Evidence of sporadic permafrost at the Qinngorput infrastructural development site in Nuuk, West Greenland”.



*River bank at Kangerlussuaq in Greenland being eroded 40 m sideways during a Jökulhlaup at the sudden emptying of an ice-dammed meltwater lake at the margin of the Greenland Ice Cap. The discharge from the lake amounted to 39 mio m<sup>3</sup> over on day. Ice-segregated permafrozen marine silty clay overlain by fluvial sand and gravel and topped by aeolian fine sand and vegetation in a 6m high erosion profile. (Photograph provided by Thomas Ingeman-Nielsen)*

The permafrost session continued with a contribution on “Permafrost and Ecosystem Carbon Stocks in northeast Greenland” given by primary authors K. M. Iversen from ASIAQ, M. P. Tamstorf from NERI, University of Aarhus and B. U. Hansen from IGG, University of Copenhagen together with co-authors from IGG, University of Copenhagen; C. Sigsgaard, B. Elberling and T. Friborg.

Dr D. Yang (CLIC Project Office and University of Alaska Fairbanks) with coauthors K. Steffen (CIRES, University of Colorado), T. Worby (Australian Antarctic Division and ACE CRC) and V. Ryabinin (World Climate Research Programme) gave an Update on Climate and Cryosphere (CLIC) Project and its relation to the International Polar Year 2007 - 2008. Furthermore, D. Yang together with B. Ye (CAREERI, Lanzhou, China) and D. Kane (UAF) presented “Permafrost impact on streamflow regime over the large northern watersheds”.

In 2009 Greenland Climate Research Centre in Nuuk has been established in Nuuk and is headed by Professor S. Rysgaard.

The Arctic Technology Centre ARTEK situated at Sanaartormik Ilinniartfik in Sisimiut and at DTU-BYG in Lyngby has continued its research, innovation and education in Arctic Engineering. Until now 20 students have finalized with a degree in Arctic Engineering and the number of new students has reached 16 to 18 per year. A. Stühr Jørgensen finalized in March his PhD-study “Assessment of three mitigation techniques for permafrost protection” and is now developing the research and education in road engineering in Danmark as well as Greenland. I. Brandt finalized a Master in Arctic Engineering on geophysical investigations for permafrost at the Thule Airbase and is now industrial PHD-student (ASIAQ and DTU-BYG) on “Integrated Geoscience Study of Extend and Effects of Permafrost Change in Greenland”.

The Danish IPA adhering body SAFT – Society of Arctic Research and Technology – has continued its cross-disciplinary outreach activities and support to MSc and PhD-students in

Greenland and the Arctic. SAFT maintains through Secretary S. Hanson (sha@spacecenter.dk) contact with Permafrost Young Research Network (PYRN).

Niels Foged (nf@byg.dtu.dk)

## FINLAND

Long-time IPA's Finnish representative Professor Matti Seppälä (Department of Geography, University of Helsinki) retired in the end of September 2009. Professor Seppälä has studied periglacial landforms and processes on both hemispheres and over four decades. Nevertheless, he has promised to continue his scientific journey in future. On the behalf of the permafrost community, I wish you Matti very pleasant and active retirement!

In northern Finland, field work for Nordic project ‘Permafrost observatory in the Nordic Arctic: sensitivity and feedback mechanisms of thawing permafrost’ (2009–10) (Finnish participant J. Hjort from the Department of Geography, University of Helsinki) was conducted in Vaisjeaggi palsa mire close to the Kevo research station. The main objectives of this project are to establish a permafrost monitoring network based on existing Nordic research stations and key research sites for assessing the effects of climate change on the permafrost environment and secondly to provide comparable data and new insight from these sites on the sensitivity and feedback mechanisms of thawing permafrost. In addition, the project ‘Spatial modelling of periglacial processes under environmental change’ (2008–2010) (J. Hjort and M. Luoto and M. Marmion both from the University of Oulu, Department of Geography) continued.

Geological Survey of Finland (P. Lintinen, H. Vanhala and J. Jokinen) and Mining Geological Company MIREKO continued co-operation in a field of geophysical characterisation of permafrost and talik structures in Northern part of Komi Republic. In late summer 2009, geophysical electrical and electromagnetic measurements were conducted at Korotaikha river area in Nets Autonomous Region in Russia where average permafrost thickness is about 200 m. The geophysical techniques tested were (1) a multi-electrode resistivity sounding system, (2) a transient electromagnetic (TEM) resistivity sounding system and (3) an electromagnetic VLF-R resistivity meter.

An international Permafrost-project coordinated by the Geological Survey of Finland (T. Ruskeeniemi and L. Ahonen) investigated the impacts of permafrost on the geochemistry and flow conditions of deep groundwaters in metamorphic bedrock terrain. The main targets were to identify the physico-chemical processes active in low-porosity, hard rocks and to increase understanding of their interaction. The focus was on the phenomena, which might have influence on the stability of the repository. Investigations were carried out in 2000-2008 within three sites in Arctic Canada (depth of permafrost = 350–540 m): Lupin gold mine, Ulu Au prospect and High Lake Zn-Cu prospect.

The research project ‘Global change impacts on sub-arctic palsa mires and greenhouse gas feedbacks to the climate system’ (PALSALARM) is carried out by the Finnish Environment Institute (S. Fronzek and T.R. Carter) and the Universities of

Copenhagen, Lund and Oulu (M. Luoto). The PALSALARM consortium organized a scientific symposium on palsa mires in Abisko, Sweden, from 28–30 October 2008. The symposium was structured in three themes:

- Theme 1: Spatial distributions of palsa mires and permafrost and its current status
- Theme 2: GHG feedbacks of palsa mires
- Theme 3: Palsa mire ecosystem and paleoecological studies

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## FRANCE

A. Decaulne, CNRS UMR6042 Geolab, Clermont-Ferrand, France, pursues researches coupling geomorphic dynamics occurring on slopes (mostly snow avalanches and debris flows) and dendrogeomorphology in Iceland, in collaboration with P. Sæmundsson (Natural Research Centre of Northwestern Iceland, Sauðárkrúkur) and Ó. Eggertsson (Iceland Forest Service, Research Branch, Mogilsá). Field work was done on this topic during the summer 2009 in Northern Iceland. For comparison, two other sites were investigated in Nordfjord, Norway, in collaboration with A. A. Beylich and K. Laute (Geological Survey of Norway, Trondheim). Results obtained during the recent studies were presented during the 7<sup>th</sup> International Conference on Geomorphology IAG/AIG, held in Melbourne in July 2009, and during the Working group SEDIBUD Workshop held in Kingston, Canada, in October 2009.

Research is also carried out on a glacier system of Svalbard since 2006. The objective of Hydro-sensor-FLOWS project (IPY#16) is to investigate the hydrology of the Austrelovenbre Glacier basin (Brogger peninsula) by continuous monitoring the space and time dynamics over a 4-years period (2007-2010). The project is coordinated by M. Griselin (UMR Thema) and C. Marlin (UMR IDES) in association with GEODE (Pau) and FEMTO (Besançon). The main objective is to improve our understanding of the system reactivity to contemporary climatic fluctuations. Different methods are used to study the glacier and its hydrology and its dynamics: image loggers (satellites and automatic cameras on the ground), loggers recording climatic data, air temperature at 20 locations on the basin and hydro-geochemical data. Stream water is sampled for chemical and isotopic analyses. At the end of the Fall 2009 field trip, the team has obtained the hydro-glacio-climatologic data for a third complete hydrological year (October-October). The rain flood events recorded in Autumn 2008 gave information concerning the rain influence in the hydrological processes, while, until that time, the team had recorded only high runoff linked to high air temperature. Summer 2008 has been in the mean 1969-1998 (i.e. colder than 2007). Summer 2009 is different with large summer periods of high air temperatures and several big events of rain. The ablation-accumulation measurements will give accurately the yearly variation in height of the glacier: that will be our second glaciological mass balance. The team noticed that, during Autumn 2008, following the flood event of mid-September, it had to re-do the mass balance measurements at the very end of September. It was totally different that the one

made by the beginning of September. The GPR investigation combined with DEM provided a first mapping of the bedrock elevation. The mapping of the glacier basement by GPR is carried out by scientists of FEMTO and AWI. Comparing the DEM of 1964, 1995 and 2007, the team has obtained the 3D difference in glacier volume. Since 1964, the Austrelovenbre glacier lost a third of its volume, and 20% since 1995, showing an acceleration in the melting process.

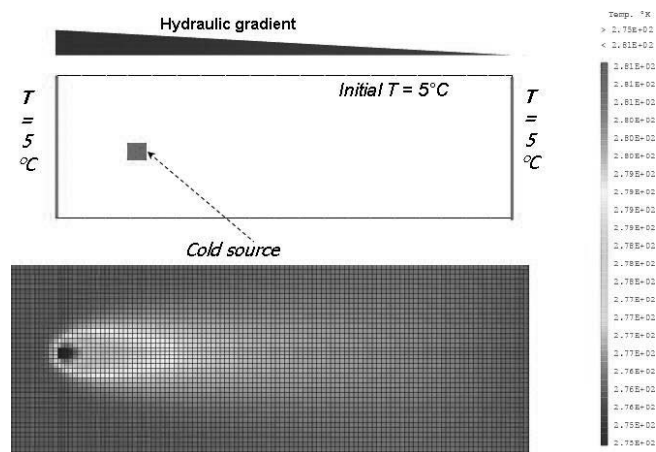


*Measurements on a glacier system of Svalbard. (Photograph provided by Christelle Marlin)*

The CLIMAFLU project (2008-2011), endorsed by the ANR program is an international cooperation between France and Russia, led by F. Costard (IDES, CNRS-Université Paris-sud XI), E. Gautier (Laboratoire de Géographie Physique CNRS UMR 8591) and A. Fedorov (Permafrost Institute, RAS, Yakutsk). Investigations of the effect of climate warming on the fluvial dynamics of the Lena river (Yakutia) is the topic of that project. F. Costard (UMR 8148, IDES, CNRS-Université Paris-sud XI) with E. Gautier and D. Brunstein (Laboratoire de Géographie Physique CNRS UMR 8591) carried out investigations on the Lena flood plain at the latitude of Yakutsk. Two expeditions took place in 2009, one in May to study the breakup phase and the second one in July after the flood season. The objective was to set up several data loggers over several islands in order to measure the thermal regime of the permafrost. This study is expected to allow a quantitative analysis of the evolution of islands in a floodplain under a periglacial environment.

C. Grenier, E. Mouche, D. Régnier from LSCE (Laboratoire des Sciences du Climat et de l'Environnement – UMR1572

) have been developing activities in numerical modeling for permafrost issues over the last years with the purpose of studying the impact of glaciation cycles on underground flow patterns. The application field typically corresponds to a 500 m depth and 50 x 50 km zone around the French underground research laboratory (operated by ANDRA, the French nuclear waste storage agency) at Bures in the eastern part of the Paris Sedimentary Basin. In the present phase, a 3D coupled Thermo-Hydro (TH) module is being developed by D. Régnier (PhD student) within the Cast3M code ([www-cast3m.cea.fr](http://www-cast3m.cea.fr)), validated against analytical solutions and benchmarked against literature cases. The model involves a Mixed Hybrid Finite Element numerical scheme and includes heat conduction, heat advection, phase change, coupled water flow. It will soon be applied to study permafrost evolution with coupled TH phenomena for various systems at various scales (underground flows in sedimentary layers under thermal stress, river taliks, thermokarst lakes). Other recent activities deal with 1D column modeling of permafrost evolution for climate reconstruction purposes (e.g. Bures, France; Ohrid Lake, Albania).



An example from model output: Heat transfer in uniform flow without phase change. (Photograph provided by C. Grenier)

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## GERMANY

At the University of Bonn, the research project SORP (Sensitivity of Rock Permafrost to regional climate change), which is part of the DFG-bundle SPCC, is centered on rock permafrost monitoring and permafrost induced rock wall instabilities. S. Verleysdonk started her Ph.D. thesis within the project with field sites in the German (Zugspitze) and Swiss Alps (Turtmann Valley and Piz Corvatsch). S. Bledow and D. Funk installed extensometer measurements at the Zugspitze and are carrying out shear tests on thawing cleft material as well as stability modeling based on empirical data. Further research focused on the relationship between summer snow cover and rock permafrost detected by refraction seismics (D. Dräbing, Turtmann Valley). M. Krautblatter discussed patterns of multiannual aggradation of permafrost in rock walls with and without hydraulic interconnectivity as well as temperature-calibrated imaging of seasonal changes in permafrost rock walls by quantitative electrical resistivity tomography at

the Zugspitze (Krautblatter et al., acc.). Within the sub-project “Monitoring and process analysis of permafrost creep and failure in changing temperature regimes” (I. Gärtner), kinematics of several rockglaciers in the Valais and Grisons were quantified combining terrestrial and remote sensing methods. Together with ground surface temperature monitoring as well as geophysical soundings these data aid in investigating rockglacier dynamics.



Extensometer measurements at the Piz Corvatsch study site ‘Kleen Chasselett’ at 2750 m a.s.l. which shows signs of permafrost induced rock fall activity and movement. (Photograph provided by Sarah Verleysdonk)

At the University of Würzburg, the permafrost research group led by C. Kneisel continued investigations on permafrost characterization using surface and subsurface temperature monitoring and geophysical mapping techniques in different (sub-)alpine and subarctic environments in Switzerland and northern Sweden.

Research on sites with sporadic permafrost below the timberline (Engadin and Appenzell, Swiss Alps), with focus on permafrost-humus interaction, thermal regime and the influence on temporal and spatial permafrost variability are continued by D. Schwindt within his Ph.D thesis. T. Rödder has started his Ph.D. project investigating the sensitivity of alpine permafrost in unconsolidated sediments and its spatio-temporal variability in a changing climate at the Murtel/Corvatsch site. This research project is part of the DFG-bundle project SPCC (<http://www.spcc-project.de>). Recently, A. Bast finished his diploma-thesis on small scale distribution of permafrost within the glacier forefield Muragl (Swiss Alps) regarding multiple geomorphological parameters. C. Kneisel and several undergraduate and graduate students undertook additional 2D geophysical surveys for investigating the spatial distribution and characteristics of permafrost on different periglacial landforms (e.g. solifluction /gelifluction slopes) in a subarctic mountain environment in the Abisko region, northern Sweden. Furthermore, permafrost conditions at an isolated lowland palsa were investigated (active-layer and near- and subsurface temperature measurements, permafrost depth detection).

At the University of Jena, C. Hilbich is currently conducting a geophysical monitoring network at 6 different permafrost

sites in the Swiss Alps with permanent electrical resistivity tomography (ERT) and refraction seismic tomography (RST) profiles within the SPCC project and in close co-operation with the Swiss PERMOS network. The applicability of both ERT and RST monitoring for the detection and quantification of ground ice degradation was investigated on short time scales by the application of appraisal analysis.

At the University of Giessen, O. Wild analyzed two data sets of near-surface ground temperatures at Stockhorn-Plateau, 3410 meters a.s.l. (Valais, Switzerland). The long-term temperature monitoring at Kleinmatterhorn (3820 meters a.s.l.) started in 1998 by L. King will be continued after recalibration of the temperature-loggers.



*Mapping of heterogeneous frozen ground conditions within the Muragl glacier forefield, 2750 m a.s.l., Swiss Alps using electrical resistivity tomography. (Photograph provided by Christof Kneisel)*

AWI (Potsdam) conducts research in the *Canadian Arctic* continuously since 2005. At *Polar Bear Pass* (Bathurst Island), field work focuses on the hydrology and energy balance of a High Arctic Wetland in cooperation with Prof. K. Young from York University. On Herschel Island and the Yukon Coastal Plain, AWI works together with McGill University (Montreal) studying coastal erosion and paleoenvironmental dynamics on the East-Beringian edge using lake sediments and ground ice. The 12<sup>th</sup> Russian-German-Expedition *Lena Delta 2009* with 35 participants took place from June to August. The overall aims are to continue ongoing research on carbon, water and energy cycling, coastal erosion, land-sea interaction and paleoclimatic reconstruction, carried out on the polygonal tundra, on Yedoma surfaces and thermokarst depressions, within the channel network and on a N-S-transect. The 141 m permafrost core from *Elgygytgyn Crater* ICDP deep drilling in Chukotka has successfully arrived in the lab. Now it is being subsampled for multidisciplinary studies between Germany, Russia, and the US. Revealing the stable oxygen isotope record from *Elgygytgyn* lacustrine diatoms is ongoing in the AWI-Potsdam lab. Periglacial surface structures were studied during the field campaign „Svalbard Permafrost Landforms as Analogues for Mars“ on *Spitsbergen* in July 2009. The data will be used as ground truth for high-resolution stereo images acquired by the high-resolution camera HRSC-AX. The AWI-project “Sensitivity of Permafrost in the Arctic” were continued to characterize the

spatial heterogeneity of the permafrost energy budget near Ny-Alesund, in spring and summer 2009. High resolution stable isotope records ( $\delta^{18}\text{O}$ , d-excess) in ice wedges from *Alaska* (Barrow) and *Northeast-Siberia* (Dmitrii Laptev Strait) enable to reconstruct regional climate changes during the late Glacial and the Late Holocene and highlight the potential of ground ice as climate archive. As a final result of a joint German-Russian-Switzerland INTAS Project, the  $^{36}\text{Cl}/\text{Cl}$  dating method was successfully applied to syngenetic ice wedges from six sites in northern Yakutian middle and late Pleistocene ice-rich deposits. A Data User Element Program (DUE PERMAFROST) was launched in spring 2009 by the European Space Agency (ESA) as a platform to users and service providers to integrate earth observation service focussed on permafrost monitoring. <http://www.ipf.tuwien.ac.at/permafrost/>. The German Helmholtz Association and the Russian Foundation for Basic Research are supporting a Joint Russian-German Young Researcher Group focused on the sensitivity of the Siberian permafrost coast to change that includes the AWI (Potsdam) and the Institute for Coastal Research (Geesthacht), along with three Russian partner institutes.

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## ITALY

The activities of the Italian permafrost communities are going on both in the Alps and in Antarctica. In Antarctica, within the project “Permafrost and Climate Change II”, M. Guglielmin (Uninsubria), N. Cannone (Univ. Ferrara), S. Favero-Longo and F. Baio (Sogetec) participated to a campaign at Rothera and Signy Stations in cooperation and with the logistical support of the British Antarctic Survey. In this campaign a new 30 m deep borehole was instrumented and included in the ANTPAS and TSP networks. Analyses of the effects of vegetation on the active layer thermal regime and on  $\text{CO}_2$  fluxes were carried out. Additionally, the permafrost monitoring stations and the ice-wedge monitoring stations in Victoria Land were inspected and maintained.

The research on weathering processes in cryotic Antarctic environment continued through a cooperation between University of Ferrara (N. Cannone), University of Turin (S. Favero-Longo, R. Piervittori) and Insubria University (M. Guglielmin) enhancing the role of bioweathering in the formation of weathering features like tafoni.

The more important project that involved almost all the Italian permafrost community in the Alps is the PERMANet project (Interreg Alpine-Space program, started in June 2008) where ARPA Vda, ARPA Piemonte with Insubria University (M. Guglielmin), the Province of Trento with University of Pavia, (R. Seppi), the University of Padova, (A. Carton) and the University of Trento (M. Dall’Amico and R. Rigon); Regione Veneto, the Province of Bolzano with Insbruck University are working under the leadership of the Bolzano Province (V. Mair).

A large range of coordinated goals are planned within PERMANet. The Regional Agency for Environmental Protection (ARPA VdA) and Fondazione Montagna Sicura (FMS) are mainly focussed on the maintenance and upgrading

of permafrost monitoring network (from surface boreholes in high-mountain steep rock walls to shallow and deep boreholes in gentle morphologies) and on the relationships between permafrost degradation and rock falls especially around the Mont Blanc Massif. Arpa Piemonte is mainly focussed on the installation of a permafrost monitoring network and for this reason has selected 5 sites in different climatic areas between 2400 and 3100 m a.s.l., where after geophysical investigations and BTS measurements, four 30 m deep, one 100 m deep and one 5 m deep boreholes were drilled and instrumented.



*View of the drilling operation for the 100 m deep borehole at Sommeiller (3000 m a.s.l.) in Upper Val Susa (Western Alps, Piemonte) where a new permafrost monitoring station has been installed in the framework of Permanet. (Photograph provided by Luca Paro)*

The Province of Trento is focussed both on the creation of a permafrost monitoring network and on the permafrost modelling. For the first aim, preliminary BTS and ground surface temperature measurements were conducted on three potential different sites for the drilling of a 50 m deep borehole, that is planned for the late summer 2009. Also two existing boreholes near the Alpine Hut “Ai Caduti dell’Adamello” in the Adamello-Presanella Group are monitored to understand the relationships between permafrost degradation and observed slope movement. Modelling activities are also performed to model the permafrost distribution in the province. A freezing-soil module has been developed inside the open source hydrological model GEOtop ([www.geotop.org](http://www.geotop.org)) by M. Dall’Amico and R. Rigon and allows to perform long term temperature simulations including phase change effects. Regione Veneto has planned to carry out one deep borehole in bedrock and one within a dolomitic rock glacier. The Bolzano Province is leading the entire project and has planned to do different boreholes both in bedrock (one 150 m long subhorizontal borehole) and within rock glaciers.

In addition, University of Turin (M. Freppaz et al) is still pursuing its research on soil characteristics at low elevation permafrost sites and soil development within patterned ground. ARPAVDA (U. Morra Di Cella, E. Cremonesi) and University of Turin started a research project on the influence of snow properties (e.g. snow depth, density, temperature, resistivity, etc.) on the soil thermal regime and the snowpack evolution in permafrost areas. The cooperation between the universities of

Pavia (R. Seppi) and Padova (A. Carton), for the research on Adamello Presanella and Ortles Cevedale mountain regions is also being continued. It consisted mainly in the continuation of near-surface ground temperature monitoring and in topographic measurements conducted for the 8<sup>th</sup> consecutive year on two active rock glaciers. One new PhD student (L. Carturan, University of Padova) focused on the climatic sensitivity of the cryosphere in the Ortles-Cevedale area. The research on the relationships between vegetation and permafrost and carbon fluxes also continue in Upper Valtellina (N. Cannone and M. Guglielmin) where a new site for monitoring of thermal and moisture conditions within the active layer and related CO<sub>2</sub> emissions has been installed. In Upper Valtellina the latter investigators pursue the measurements of active layer thermal regime, snow spatial variability and vegetation phenology and variability started since 2006. The Insubria university (E. Binaghi and M. Guglielmin) started a research project on the use of neural network approaches for permafrost distribution modelling.



*View of the new permafrost monitoring station installed in January 2009 by Insubria University (M. Guglielmin and F. Baio) at Rothera point (maritime Antarctica) with the logistic support of BAS. (Photograph provided by Mauro Guglielmin)*

The University of Pisa (A. Ribolini) continued his research in the Maritime Alps with ground surface temperature monitoring and geophysical (electrical tomography and radar) investigations on active and inactive rock glaciers and other periglacial landforms.

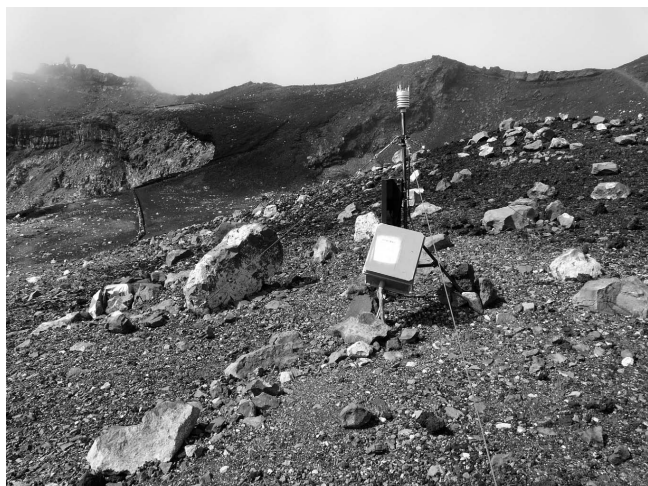
Finally, L. Paro (Arpa Piemonte) is finalizing his PhD on the development and the paleoclimate meaning of block streams in the area of Val Susa (Piemonte, Western Alps).

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## JAPAN

In the Japanese archipelago, a permafrost study on the Fuji volcano (3776 m a.s.l., MAAT=  $-6^{\circ}\text{C}$ ), which was started last year, was re-designed because of an unexpected high ground temperature that was monitored in two 3-m deep boreholes at the summit area (A. Ikeda, G. Iwahana, T. Sueyoshi, K. Harada, R. Nishii and H. Arai).



*Monitoring system installed on top of the Fuji volcano. (Photograph provided by Atsushi Ikeda)*

In the southern Japanese Alps, an automatic camera has visually recorded movements of surface stones, data which were combined with records of frost heave, soil temperature and moisture to explore the detailed dynamics of solifluction features (N. Matsuoka). Radiocarbon dating of relict rock glaciers around Mt. Ainodake (MAAT=  $-2^{\circ}\text{C}$ ) indicated the advance of the rock glaciers from the Last Glacial Maximum to the Late Glacial (A. Ikeda and R. Nishii).

Several overseas projects are also going on. In Svalbard, a monitoring campaign is being continued in order to understand the dynamics of ice- and soil-wedge polygons, mudboils and a polar rock glacier with a variety of methods (N. Matsuoka, T. Watanabe), in collaboration with UNIS (H.H. Christiansen) and the University of Oslo (O. Humlum). Detailed (2D and 3D) geophysical sounding was used to detect subsurface frost wedge structures under non-sorted polygons and to illustrate temporal variation in the subsurface moisture regime (T. Watanabe).

In Alaska, a project named '2004 Forest Fire Impacts to Hydrological Cycles, Permafrost and Eco Systems in Central Alaska' is being pursued since 2005 in order to monitor permafrost conditions after severe wildfire (K. Harada, K. Narita, K. Saito). In August 2009, the following observations were carried out at the Kougarok site near Nome, Alaska: thaw depths, surface roughness compared with satellite data and ground temperatures (since 2007). Vegetation surveys were also made in order to characterize the recovery after wildfire at burned sites. Continuous data of thaw depth and ground temperature could be obtained during these investigations and will help to understand the effect of wildfire on permafrost condition and vegetation recovery.

In Siberia, the RIGC (Research Institute for Global Change) in JAMSTEC (Japan Agency for Marine-Earth Science and

Technology) and the Melnikov Permafrost Institute, Siberian Branch of Russian Academy of Science, have started to improve distributed soil moisture and temperature monitoring in the active layer around Yakutsk region since the spring of 2009 in order to better characterize increased soil moisture and altered active layer thermal properties, which are likely due to widespread warming of the surface layer of permafrost in this region. An educational activity, a field science short course 'Taiga forest ecosystem on permafrost –Role of permafrost zone in a global change–' for graduate students and young scientists was conducted in the Spasskaya Pad Research Station of the Institute for Biological Problems of Cryolithozone in Yakutsk, Russia from the 1st to the 7<sup>th</sup> of August 2009. This summer field course was provided by the Global COE Program of Hokkaido University 'Establishment of Center for Integrated Field Environmental Science' (<http://www.ees.hokudai.ac.jp/gcoe/>).

The Japanese Permafrost Association was formally founded as the national organization corresponding to IPA in September 2008, aiming at promoting collaborative research, exchanging information on permafrost monitoring and organizing scientific meetings. In the 2008–09 period, meetings on permafrost and periglacial research were held twice (November 2008 and February 2009) in Sapporo. About 20 scientists and students participated to each meeting.

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## KAZAKHSTAN

The Kazakhstan Alpine Geocryological Laboratory and the Permafrost Institute, Siberian Branch of the Russian Academy of Sciences are in the process of elaborating a map on "Geocryological Hazards in Kazakhstan" (scale 1:5000000). Natural and technogenic geocryological processes and phenomena are divided into three categories on a scale of "danger": low danger, average danger and high danger.

A finding from this publication is that anthropological changes to the environment often induce the activation or the intensifying of geocryological processes and subsequent hazards. The occurrence of these features is generally strongly driven by local geographical characteristics. In mountainous areas, the degree of danger in some areas is determined not by the frequency of geocryological processes and phenomena, but by the dimension of the most significant ones, namely, glacial mud-flows, rock-glaciers down movement and cryogenic rockslides. All mountainous regions of Kazakhstan are also characterized by high seismic activity which adds to the likeliness of occurrence of major natural hazards.

The geothermal monitoring of seasonal frozen ground and permafrost in Zailiyskiy Alatau (Northern Tien Shan) is being continued. New results show that since the 2000-2001 period, temperatures have been further decreasing throughout the permafrost profile. The long winter and cool summer of 2008-2009 have caused the lowest depth of seasonal frozen layer (about 4 m) observed over the past 32 years of observations.

Other new results from different settings in the mountains of Northern Tien Shan confirmed that the depth and intensity of freezing depends not only on the severity and snowiness of the

cold period, but also on the temperature of the ground before freezing and the relationship between the onset of freezing and the timing of the snow cover.

Evidence of crevasses in a rock glacier in the Uzynbulak river valley (Dzhungarskiy Alatau) was observed by the Kazakh researchers in 2009. The fast motion of the rock glacier is explained by powerful seismic collapse in the upper part of the valley it is located in. Sudden rock collapse on the rock glacier has caused a sharp increase in the plasticity of the frozen matrix and led to the increase of the motion speed. As a result, the rock glacier has moved downwards along the Uzynbulak river valley by more than 2 km.

Data on morphology, genesis, dynamics and evolution of rock-glaciers from Asia, America, Greenland and Antarctica was summarized in the journal «Cryosphere of the Earth» (#2, #3, 2008).

Akhmetkal Medeu, Aldar Gorbunov and Eduard Severskiy (ingeo@mail.kz).

## MONGOLIA

The joint Japanese and Mongolian project of the Northern Hemisphere Cryosphere Program of RIGC, sponsored by JAMASTEC continues into its seventh year in Nalaikh and Terelj areas near Ulaanbaatar. In addition, within the framework of this project M. Ishikawa, Saruulzaya from Hokkaido University and Jambaljav, Dashtseren, Jargaltulga, Javhlan from Institute of Geography, MAS started to monitor ground temperatures in more than 30 shallow (5-10 m deep) boreholes with and without permafrost, located mainly in Altai and southern Hangai regions, Western Mongolia. Last year the boreholes were drilled by the Institute of Geography, MAS. This year JAMASTEC provided full funds for field work and HOBO U12 data loggers for equipping the boreholes.

For now 13 years, monitoring of permafrost temperatures and active layer thickness has been continued successfully in more than 40 (shallow to deep) boreholes in permafrost in Mongolia within the framework of the International CALM and GTN-P programs through collaboration between N. Sharkhuu and scientists from University of Alaska, Fairbanks and University of Delaware. In addition, within the framework of the above NHCP/RIGC project N. Sharkhuu started collaboration in monitoring of permafrost in some selected boreholes, located in the Northern Mongolia.

Within the framework of PIRE (Partnerships for International Research and Education) - Ecological and Evolutionary Effects of Climate Change and Anthropogenic Influences in Mongolia project, implemented by the University of Pennsylvania and National University of Mongolia, sponsored by National Science Foundation of the U.S., Prof. Alain and graduate student Sh. Anarmaa from the University of Pennsylvania have started monitoring changes in soil carbon respiration, soil temperature and moisture content in experimentally warmed chambers, which simulate global warming, and control plots at 12 observation sites, underlain by discontinuous permafrost, in the eastern Hovsgol area, Northern Mongolia. In addition, research on quantifying above- and below-ground carbon stocks is planned to be carried out. This project will continue for next

four years. N. Sharkhuu conducts monitoring of permafrost temperature and active layer thickness in nine boreholes in this area as he did in the last seven years.



*Drilling in sub-pingo water layer at 32.4m depth at the top of Mongot pingo, August 8, 2009. (Photograph provided by Kenji Yoshikawa)*

K. Yoshikawa, University of Alaska Fairbanks and N. Sharkhuu conducted borehole drilling (down to 33 m) at a 20 m high Mongot pingo top in Tes valley, Northern Mongolia. The purpose of this drilling was to understand pingo ice formation using isotope analysis, to monitor permafrost temperature, active layer and artesian water pressure by data loggers. This pingo was also drilled in 1968 and water was encountered under pressure at 32 m. The initial flow resulted in a 70 cm high artesian fountain which flow was carefully monitored for 120 hours by N. Sharkhuu. New data from the drilling enables to estimate some change in dynamics of the pingo evolution during last 40 years.

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## NETHERLANDS

*Carbon and water exchange at the water-atmosphere interface in Siberia*

Research in the taiga and tundra ecosystems in eastern Siberia is performed in cooperative projects of the Institute for Biological Problems Cryolithozone (IBPC) of the Siberian Division of the Russian Academy of Sciences in Yakutsk and the Vrije Universiteit (VU) in Amsterdam (Department of Hydrology and Geo-Environmental Sciences).

In a larch/birch forest near Yakutsk (Spasskaya Pad Field Station) and on a tundra site near Chokhurdakh in the Indigirka lowlands (Kytalyk reserve) flux measurements have been made with eddy correlation towers. The aim is to estimate the annual exchange rates and their interannual variability, and to determine the sensitivity to environmental factors of the fluxes.

The 2006-2009 campaigns have been funded by NWO (Dutch Organization of Scientific Research), VU and RFBR (Russian Foundation for Basic Research). Participating Dutch institutes are VU Amsterdam, Utrecht University (Paleoecology) and Wageningen University (Vegetation Ecology). This resulted in joint fieldwork at the tundra site in the summers of 2007-2009,

including a methane flux measurement campaign on tundra and floodplain environments and thermokarst lakes, vegetation ecological experiments and sampling of lake bottom sediments for paleo-ecological research. Also a site was established for longer term monitoring of active layer thickness. In the summer of 2008, for the first time eddy covariance measurements using a cavity ringdown laser system were successfully set up and operated at the tundra site; its operation continued in the summer of 2009. Contact scientist: K. van Huissteden (ko.van.huissteden@falw.vu.nl).

#### *The Willem Barentsz Polar legacy*

When Willem Barentsz discovered Spitsbergen in 1596 he could never have imagined that more than 400 years later dozens of Dutch scientists go over there for all kinds of research and there would even be a Dutch Arctic Station. Nowadays Dutch researchers explore a variety of research topics from polar Archaeology till polar Zooplankton. A lot of these polar researchers are now working together in the Willem Barentsz Polar Institute (WBPI), an institute for Arctic and Antarctic research, although Willem Barentsz never went to the Antarctic.

The WBPI wants to be a clear Dutch identity in the international field, enhance the co-operation between Dutch polar researchers and contribute to polar education and outreach activities. The WBPI wants to give a positive boost to new initiatives from the Netherlands in the polar areas. It hopes to create an organisation that is a clear contact point of Dutch research in polar areas for the international field.

The first WBPI symposium was held in Groningen, 22<sup>th</sup> October 2009, followed by a day from the Netherlands Polar Network for early career scientist (NLPN) that is supported by the WBPI. The WBPI encourages students to do international polar courses and is willing to help (international) students to find suitable courses and master projects in the Netherlands.

More information can be found on the website: [www.wbpolar.nl](http://www.wbpolar.nl).

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## NEW ZEALAND

This year we are celebrating 50 years since the first soil/permafrost scientific expedition in the Ross Sea Region of Antarctica. It was undertaken by Prof. John D. McCraw and Dr Graeme G. Claridge. They set off from Scott Base on the Massey Ferguson tractors that Sir Edmund Hillary took to the South Pole in 1957/58 and drove to New Harbour, from which they travelled on foot for several weeks exploring the Taylor Valley and adjacent areas. Graeme Claridge went on to become an expert on Antarctic soil chemistry and, with Iain Campbell, authored the most authoritative book available on the soils of Antarctica. Both McCraw and Claridge are fit and well - (permafrost and cryosol research must be good for you) and we will be holding a celebration to mark their original journey in November this year.



*Graeme Claridge and John McCraw setting out on the first Antarctic soil and permafrost investigation expedition on the Hillary tractors, 50 years ago, in October 1959. (Photograph provided by Megan Balks)*

Looking forward in time, Meridian Energy, in Alliance with Antarctica New Zealand and with support from the US National Science Foundation (NSF), are constructing a three turbine 'proof of concept' wind farm on Crater Hill, Ross Island, Antarctica. Following commissioning in February 2010, the wind farm will supply power to and link the electrical grids of New Zealand's Scott Base and neighbouring US McMurdo Station offsetting fuel use. Sub-zero temperatures, absence of batching plant, aggregate and large quantities of fresh water have meant that it is not possible to construct a typical concrete gravity pad wind turbine foundation. Instead, the project has utilised a pre-fabricated foundation comprising eight 13-tonne concrete blocks buried in the permafrost. The blocks are fixed to an eight-legged steel 'spider' with a flange that bolts to the wind turbine tower. Each concrete block is also fitted with two 12m long ground anchor bolts drilled and grouted in as an additional precaution for extreme weather events.



*Foundations going in for the proposed windfarm site on Ross Island, Antarctica. (Photograph provided by Megan Balks)*

Most New Zealand Antarctic researchers are currently involved in a funding bidding round that will largely determine the fate of NZ Antarctic permafrost research for the next six years. There is only a small pool of funds and a great deal of competition from many science areas so it is a challenging time for many.

Megan Balks (m.balks@waikato.ac.nz).

## NORWAY

### *TSP Norway IPY project activities*

The Permafrost Observatory project: A contribution to the Thermal State of Permafrost in Norway and Svalbard (TSP Norway) was continued. The first full year data from all the TSP boreholes have now been downloaded from different landforms in Svalbard and northern Norway. A few new boreholes have been drilled and instrumented to complete the Nordenskiöldslund Permafrost Observatory in Svalbard.

NORPERM, the Norwegian online permafrost database, was launched spring 2009, and contains TSP Norway data and other permafrost data from Norway and Svalbard. The project can be followed on [www.tspnorway.com](http://www.tspnorway.com). A. Kholodov from University of Fairbanks Alaska and the TSP Alaska project visited UNIS in April 2009 to discuss the NORPERM database for future US permafrost database developments.

TSP Norway partners play an important role together with other permafrost partners in Norway in organising the Third European Conference on Permafrost (EUCOP) in Svalbard in June 2010, which will be an important event to present the first TSP Norway IPY results. Registration has now opened at the conference website: [www.eucop2010.no](http://www.eucop2010.no).

### *Geology Department, UNIS*

Permafrost and periglacial studies were done by H. H. Christiansen, H. Juliussen, L. Kristensen, U. Neumann and M. Eckersdorfer, partly within the TSP Norway project, but within the CRYOSLOPE Svalbard research project ([www.skred-svalbard.no](http://www.skred-svalbard.no)). L. Kristensen submitted her PhD thesis on the glacier surges in permafrost environments. M. Eckerstorfer started a PhD study on snow avalanches and meteorological control in Svalbard, cooperating closely with the CRYOSLOPE Svalbard project.

The department participated in the Nordic Council funded Nordic collaboration research project 'Permafrost Observatory in the Nordic arctic: sensitivity and feedback mechanisms of permafrost change' led by B. Elberling, University of Copenhagen, Denmark. In summer 2009 sediment cores from marginal permafrost areas, palsas in northern Sweden (Tavvavoma site), Finland (Kevo site) and Norway (Neiden and Karlebotn areas) were collected and thermistor strings established in shallow boreholes.

The intensive graduate course AG-330 Permafrost and Periglacial Environments were run for the third time in April 2009 with 20 students.

### *Physical Geography, Department of Geosciences, University of Oslo*

Within the CRYOLINK project B. Etzelmüller, H. Farbro, O. Humlum and T. Hipp, together with K. Isaksen ([met.no](http://met.no)) and R. Ødegård (HiG) gathered the first years data series from 15 boreholes in southern Norway. In addition, geophysical soundings were carried out at all sites. A permanent geoelectrical monitoring station was established at Juvvasshøe in Jotunheimen. During September, new active layer monitoring stations were established, utilising high-resolution thermistors and automatic loggers. Both equilibrium type and transient heat flow models are developed within the project.

The project on mountain meteorology, snow cover,

vegetation, ground temperatures and interaction between permafrost and glaciers in southern Norway continues (O.Humlum). M.Ferbarlein's MSc project on palsas came to a successful end in 2009.

University of Oslo in collaboration with UNIS received funding for student and faculty member exchange with the University of Ottawa (A. Lewkowicz) and Carleton University (C. Burn) from SIU (Norwegian Center for International Cooperation in Higher Education). The project (CryoEX) facilitates exchange of faculty members and students.

### *Department of Geography, NTNU*

At the Department of Geography ground surface temperature monitoring has been carried out by I. Berthling along a steep climatic gradient of the inner fjord/western mountain areas in Southern Norway. This is now part of the ESF SedyMONT project led by A. Beylich (NGU/NTNU) and funded by the Norwegian Research Council. Ground surface temperature monitoring of steep rockwalls in Innerdalen, Western Central Norway is undertaken by J. Wasrud and I. Berthling. Within the watershed of Vekve in Oppdal, Central Norway, monitoring of ground temperatures and thaw consolidation processes takes place (I. Berthling, G. Vatne, A. Beylich, W. Larsen, L. R. Libach).

### *Norwegian Meteorological Institute, Norwegian Geological Survey and other research Institutions*

The Norwegian Geotechnical Institute (R. Frauenfelder) is active in Northern Norway, studying temperatures and dynamics of a rock glacier in Nordmannvikdalen, in collaboration with University of Oslo (J. Tolgensbakk). In Signadalen landslide activity is analysed, in collaboration with the Norwegian Meteorological Institute (K. Isaksen).

The project PYRN-TSP (Permafrost Young Researchers Network's Contribution to the Thermal State of Permafrost Project in the Nordic Countries) established in September 2008 a 58.5 m deep borehole at Iskoras in Karasjok, Finnmark, Northern Norway. The first data from the borehole was collected in January 2009 and later in summer 2009. A high precision datalogger and a 25 m thermistor chain were installed summer 2009. Data shows active layer depths of more than 8 m and  $-0.4$  °C at 50 m depth. (K. Isaksen, M. Johansson, H. Farbro, B. Etzelmüller, H. Christiansen).

PACE borehole data from Juvvasshøe and Janssonhaugen were collected. A new official weather station was established by the Norwegian Meteorological Institute at Juvvasshøe in June 2009. Data is available at [yr.no](http://www.yr.no/place/Norway/Oppland/Lom/Juvvasshøe/) (<http://www.yr.no/place/Norway/Oppland/Lom/Juvvasshøe/>).

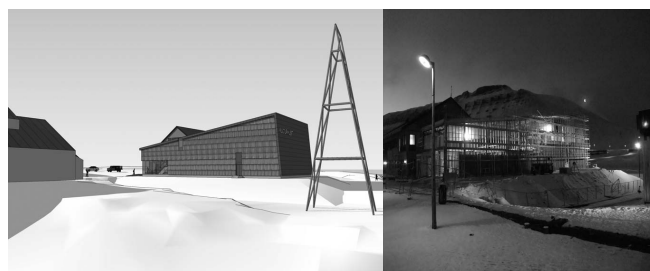
In the Troms and Møre and Romsdal area of northern and southern Norway respectively, temperature data collection are continued in a permafrost and climate monitoring project on unstable rock slopes in Norway. The project was established in 2001. (K. Isaksen, L.H. Blikra, H. Farbro, T. Eiken and J.L. Sollid).

On Dovrefjell, southern Norway, collection of temperature data was continued from 11 boreholes (9 m deep) along an altitudinal transect across the mountain permafrost transition zone. These boreholes were drilled and instrumented in October 2001. The objective of the study is to model the trend

and variability of mean annual ground temperature (MAGT) and to evaluate the influence of the snow cover on mean annual ground surface temperature (MAGST) in a high mountain terrain. (R.S. Ødegård, K. Isaksen, T. Eiken and J.L. Sollid). In the same field area data from temperature data loggers was collected as part of a Norwegian monitoring programme for palsa peatlands, co-ordinated by the Norwegian Institute for Nature Research (A. Hofgaard, K. Isaksen, R.S. Ødegård, T. Eiken, J.L. Sollid).

#### *Technology department UNIS, Sintef and Instanes Polar*

The local authority in Longyearbyen is building a new cultural centre to be completed in 2010. The center has a footprint of 800 m<sup>2</sup>. Due to challenging ground conditions with high ice content and salinity, it was decided to use a foundation system based on a heat pump cooling system. In this way possible effects of climate change and permafrost warming can be mitigated. Sweco Svalbard is consulting engineer for the project and Instanes Polar has been responsible for the geotechnical design. The construction process can be followed at: <http://www.lokalstyrer.no/files/kulturhus/byggebilde/bygg.jpg>



*Construction of new cultural centre in Longyearbyen.  
(Photograph provided by Longyearbyen lokalstyrer)*

Together with the Norwegian Public Roads Administration (NPRA) SINTEF has conducted a study concentrating on alternative frost isolation materials for roads. Three different isolation materials were tested over a period of 3 years in Melhus. At the test site 4 road sections were constructed including one reference sections. The sections were isolated with light weight expanded clay aggregate, expanded glass aggregate and XPS (extruded polystyrene). All sections were instrumented to measure temperature at different depths.“

During her master thesis work, M. Nokken studied the behaviour of foundation of the Longyearbyen building mass. Her work concentrated on comparing different foundation types and how they performed with respect to differential settlements. The work was supervised by UNIS Associate Professor L.O. Grande.

Ole Humlum and Gisle Håland ([gish@statoil.com](mailto:gish@statoil.com)).

## **POLAND**

Investigations on permafrost and contemporary periglacial phenomena were carried out in 2009 largely in the polar regions and high mountain areas on the Northern Hemisphere: Spitsbergen, the Tatra Mountains and Scandinavian Mountains (Abisko region). They are based and are continuation of the IV International Polar Year 2007/2009 programs: GLACIODYN,

KINNVIKA, POLARCAT, TOPOCLIM, as well as the IPA – CALM project.

Measurements of permafrost active layer depth, its thermal condition, as well as its dynamics were carried out at the sites included into the CALM project (Site P1 Calypsostranda – base of Maria Curie-Skłodowska University (Lublin) and Site P2 - Kaffjöyra – station of Nicolas Copernicus University (Toruń). Studies of frost process dynamics were also undertaken near the Polish Polar Station in Hornsund, as well as in the region Petuniabukta where the base for Adam Mickiewicz University expedition (Poznań) is located. There were also large-scale explorations on occurrence of mountain permafrost in some areas of central and northern Europe (W. Dobiński – Silesia University).

In April/May 2009 IPY research continued in the POLARCAT project and focused on anthropogenic pollution of atmospheric precipitation in the region of Hornsund Fjord. Snow pits on Werenskiöld and Hans glaciers were sampled by W.E. Krawczyk (University of Silesia) in cooperation with K. Miękała (Wrocław University) and D. Puczek (Institute of Geophysics, PAS) from the TOPOKLIM project and conducted analyses of inorganic ions, organic compounds and isotopes. Daily precipitation samples were taken at the environmental station in the Fuglebekken. Sampling in the Fuglebekken aimed at collecting nutrient concentrations in waters at different distances from bird colonies and to describe the hydrochemical environment characteristic of different plant and algal communities. The results of this sampling will also provide information on the intensity of chemical weathering processes in the permafrost active layer.

In the KINNVIKA project, in August, 12-14 water samples originating from permafrost thawing were taken on Storsteinhalvoya, Nordaustlandet at 80°N with the aim to investigate intensity of chemical weathering processes of rocks in the northernmost part of Svalbard, in a polar desert environment. GPR profiles were conducted on uplifted marine terraces, close to the Kinnvika station by P. Dolnicki (University of Silesia).

The GLACIODYN project (headed by J.Jania, Silesia University) covering dynamics of arctic glacier development under changing climate conditions and rising sea level was further pursued in 2009. In particular, the frontal parts of polythermal glaciers and their forefields were investigated to better understand the glacier/permafrost interactions. The studies employed geodesic and geophysical methods such as shallow electromagnetic sounding, shallow seismic sounding and ground penetrating radar.

In the summer of 2009, a large range of interdisciplinary studies of periglacial phenomena were carried out in the region of stations/bases of Polish universities. The results of investigations will be published and presented at international conferences.

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## PORTUGAL

The year 2009 has been important for Portuguese permafrost research and contributed to the consolidation of research, funding and critical mass. Activities focused on three main subjects: i) Antarctic permafrost and active layer dynamics, led by the Centre for Geographical Studies, University of Lisbon (CEG-UL); ii) Chemistry of Arctic permafrost by IPIMAR; iii) Earth-Mars analogues by CERENA - Instituto Superior Técnico, UTL.

The CEG-UL is leading the FCT-funded project PERMANTAR in Livingston (LI) and Deception (DI) Islands (Antarctic Peninsula region), which also involves the Centre of Geophysics of the University of Lisbon and Centre of Geophysics of Évora. The project includes also the universities of Alcalá (Spain) and Buenos Aires (Argentina), and the Bulgarian Antarctic Institute. PERMANTAR collaborates closely with the Spanish project PERMAMODEL-IPY. Main activities focused on the installation and upgrading of permafrost and periglacial processes monitoring sites: i) a new 8 m borehole in LI, ii) three new 4-5m boreholes (collaboration with the Russian Academy of Sciences) in DI, iii) new CALM-S sites in DI and LI, iv) a meteorological station in LI, v) solifluction, thermokarst and rockglaciers monitoring sites, vi) time-lapse cameras, vii) year-round monitoring with resistivimeter with datalogger in DI, viii) electrical resistivity tomography surveying in LI, and ix) n-factor monitoring sites in DI. Master theses on Antarctic permafrost have been presented by A. Trindade and R. Melo (<http://www.antecc.org>). Education and outreach activities have been organized, including talks in schools, public lectures and a permafrost film "Permafrost! Polar science at 62°S" for classroom activities. It will be freely available in DVD to schools and open-access in the Internet. The CEG-UL team continued the scientific coordination of the grant program New Generation of Polar Scientists funded by Caixa Carbono Zero (CGD). This program involves full-time funding of two students on permafrost research in a total of six grants in polar science.



*Drilling permafrost monitoring boreholes at the Crater Lake CALM-S site, Deception Island, Antarctic. A collaboration between Argentina, Portugal, Russia and Spain in the framework of the IPY TSP project. (Photograph provided by Gonçalo Vieira)*

IPIMAR's research on permafrost was conducted in Umuijaq, Northern Québec. The main objectives are studying carbon and contaminant chemistry in thermokarst lakes and their hydrological impact on rivers, sea and snow pack. Measurements of biogas fluxes and sampling of water, ice, snow and sediments for analysis were conducted. Umuijaq is

an area of carbon-poor permafrost which contrasts with the results obtained in 2008 in a carbon-rich permafrost area. This study contributes to a better understanding of the impacts of permafrost thaw on the carbon and trace element contaminants cycles.

CERENA continued researching automated mapping and characterization of polygonal networks on Mars. Research focused on the detailed analysis of the NASA Phoenix landing region (around 68° N), which are extensive plains largely occupied by small-scale polygonal terrains. These were difficult to perceive in previous imagery but are now unveiled by the HiRISE camera onboard Mars Reconnaissance Orbiter (30 cm/pixel). The huge number of small polygons (diameter around 4 m) demonstrates the necessity of using automated approaches allowing for a detailed mapping of these extensive networks. This will contribute to gather data to help probe into the most widely accepted genetical models, namely thermal contraction of permafrost.

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([vieira@campus.ul.pt](mailto:vieira@campus.ul.pt))

## ROMANIA

Activities of the Periglacial Romanian Research Group during 2009 focused on (1) geophysical investigations on glacial and periglacial deposits, (2) climate change through meteorological and climatological data in Carpathian Mountains, (3) paleoenvironmental reconstruction of glacial and periglacial environments in Romanian mountain area, connected especially to relict rock glaciers.

At the Department of Geography, West University of Timișoara, P. Urdea and his team (M. Torok-Oance, M. Ardelean, F. Ardelean, A. Onaca) are continuing the application of 2D electrical resistivity tomography, with measurements on rock glaciers, scree slopes and solifluction lobes in Făgăraș Mountains, the highest Romanian mountains. Also, the Bâlea area (central part of Făgăraș Mountains) is being used by P. Urdea and A. Onaca to introduce undergraduate students to glacial and periglacial geomorphology through a 7 days final second year field trip. A new area in the Southern Carpathians has been mapped and studied geomorphologically, the periglacial forms seem to have been active during the Little Ice Age, a cooling being proven by dendroclimatological and dendroecological analyses, carried out by I. Popa (Forest Research Station Câmpulung Moldovenesc).



*DC resistivity investigations on the solifluction lobe Paltina (Făgăraș Mountains). (Photograph provided by Petru Urdea)*

In order to investigate the coupling between several periglacial processes and climate - in the context of the global warming, a project on collecting meteorological data series from the periglacial belt was launched by the collaboration between two teams from University of Bucharest, headed by A. Vespremeanu-Stroe, and from West University of Timișoara, headed by P. Urdea. The studies of temperature regime of the ground (solifluctional forms, rock glaciers, earth hummocks) and free face-rocks walls are carried out year-round at a network of permanent sites established at high altitude in the Eastern and Southern Carpathians, with a focus on the Retezat and Făgăraș Mountains. Over 100 data loggers for temperatures and humidity have been installed. The investigators undertook Basal Temperatures of Snow (BTS) measurements, geodetic measurements (with Sokkia 610 topographic station) monitored the Pietrele and Valea Rea rockglacier movements and the water temperatures of the springs situated on the front of 7 rock glaciers in Retezat Mountains. Also, the team led by A. Vespremeanu-Stroe has been conducting morphometric analyses of the shape of Carpathian relict rock glaciers.

A. Munteanu (Bucharest University) and E. Marinescu (Craiova University) defended their PhD thesis on the geomorphology of Piatra Craiului Mountains and, respectively, Gilort basin (Southern Carpathians), with special chapters dedicated to glacial and periglacial forms and processes.

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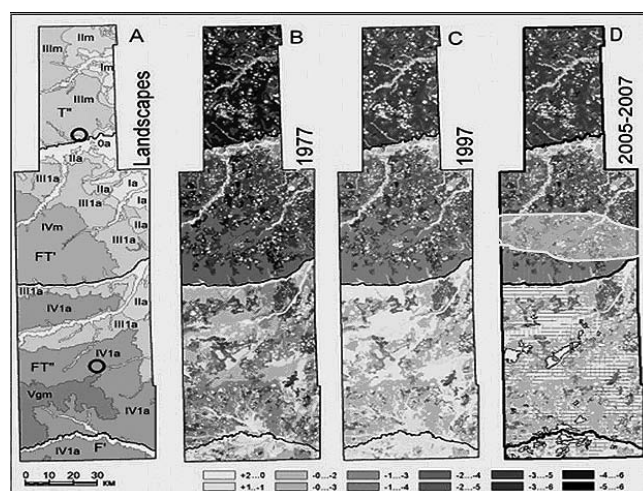
## RUSSIA

In 2009, the research of Russian geocryologists has focused on the exploration of the spatial and temporal characteristics of the cryosphere, on the inhomogeneous reaction of the cryosphere to global and regional climate change, and on the geocological and the engineering-cryolithological peculiarities of the northern regions. A series of basic research projects are carried out on the following issues: “Cryosphere as life support and biodiversity conservation environment”, “Evolution of cryosphere in conditions of varying climate”, “Permafrost of the Arctic seas and the continental margins of the Western sector of Eurasia: assessment of the contemporary state, characteristics of the dynamics, geocryological history, transformation of frozen and cryotic rocks, hydrocarbon emanation”, “Permafrost and Arctic shelf in conditions of the varying climate, ecosystem stability and gas-hydrates, processes of organic matter disposal” (ECI SB RAS).

Mass settling of the permafrost table at the depth of zero annual amplitude has been observed and verified by drilling and seismic investigations (microseismics) in the western Siberian forest-tundra. Over a period of 25-30 years, the pre-tundra light forest has moved approximately 30-40 km northward (ECI SB RAS).

Researchers at Moscow State University demonstrated that the change in a number of permafrost characteristics under climate warming conditions is determined by the aggregation of features and components of the landscape changing under climate warming. Changes of the permafrost characteristics of the aggradational type (decrease and stabilization of the permafrost temperature, diminishing of the seasonal

thawing layer, ice enrichment of permafrost upper horizons) are observed in certain landscape conditions against the background of degradational trends (increase of the permafrost temperature, extension of the talik's area) (MSU, Geographical Department).



*Natural dynamics of permafrost temperatures at the territory of Urengoy gas-field (Western Siberia). A – geosystem types; B, C, D – ground temperature in 1977 (B), in 1997 (C) and in 2005-2007 (D); horizontal lines – Areas of observed permafrost settling; Whitened area – Areas of expected permafrost settling. (Photograph provided by Dmitriy Drozdov)*

Monitoring of permafrost parameters (rock temperature and active layer depth) have been continued at the steady-state-stations in the framework of Russian and International IPY projects: Thermal state of permafrost, Arctic monitoring of active layer, Dynamics of the Arctic coasts, Change of vegetation cover. At the anthropologically-disturbed sites of Nadym and Urengoy steady-state-stations the network with long series of observations on ground temperature has been renewed (ECI SB RAS).

Results on changes in ground temperature, active layer thickness, daylight surface settlement, variations in CO<sub>2</sub> emissions have been obtained at the field steady-state-station and monitoring sites on the permafrost territory of Yakutia over a period of 10-15 years. The degree of reaction of permafrost landscapes to various anthropogenic disturbances (logging, plowing area, fires, etc.) in a changing climate have also been a focus of these investigations (IMZ SB RAS).

A series of observations on ground temperature on the accumulative surfaces of the Yenisei Gulf (with new temperature loggers) are being pursued. New data on the two-stage structure of the Ice Complex in the Dixon village and on the development of thermokarst processes on the Sibiryakova Island have been obtained (ECI SB RAS, VNIIOkeangeologiya, MSU).

The works on the geotechnical monitoring of the railroad bed and embankment of the Obskaya-Bovanenkovo railway are in progress. This is the most northern railway in the world and it will go as far as the gas fields of Yamal Peninsula in the north of Western Siberia. A forecast on the evolution of cryogenic hazard processes has been elaborated, with detailed sections on recommendations for engineering protection of the embankment and the surrounding area as well as suggestions

on improvement of the embankment construction for the sustainable exploitation of the railway (PNIIS).

Researchers at Fundamentproject conducted a large range of research projects with the objective to create special GIS geocryological maps: A 1:1 000 000 scale geocryological map of European North of Russia, an album of the landscape, soil, vegetation maps and maps of cryogenic processes activity for the Eastern part of Yamal Peninsula (1:100 000 scale) and an album of maps along the prospective path of the Murmansk-Volkhov gas-pipeline (Fundamentproject).

Using GIS technology, a series of digital permafrost maps of various scales including its characteristics (ice content of surface sediments, ground temperature, active layer thickness and freezing layers as well as moisture content) have been compiled for the natural environment of Yakutia (IMZ SB RAS).

Based on the results of engineering-geological surveys, a series of special electronic maps on the projected route of the Polunochnoye-Salekhard railroad along the foothills of the eastern slope of the Northern and Polar Urals has also been created (PNIIS).

At the Geology Department of Moscow State University, two methods have been developed: 1) A method of determining of the long-term strength, the durability and the rate of deformation of frozen ground in order to evaluate its bearing capacity for the construction foundation and 2) a method for the determination of the minimum values of thawing ground strength taking into account the changes in the physical and mechanical properties and in the pore pressure observed during thawing (MSU, Geology Department).

A series of experimental methods for the strengthening of the foundations of large constructions have been conducted in the Norilsk region. These setups include (in addition to the conventional cooling from underground or the use of seasonal cooling devices in the perimeter of constructions) static pressing down of piles to the bearing horizons, partial cementation of thawed gravel-pebbly or sandy soils, installation of buried subsidiary beams in the grid as well as widening of the upper part of the pile etc. (MSU, Geographical Department).

The international student field courses on permafrost in the North of Western Siberia were carried out this year again. In 2009, the student field courses were organized on board of the ship „Sovetskaya Arktika“ by the Geographical department of Lomonosov MSU, IKZ and LIN SB RAS and VNIIOkeangeologiya. Research took place at the Yenisei River, the Yenisei Bay, the Kara Sea and the Gydan Bay.

The following publications have been released by Russian researchers in 2009:

- The sixth part of the book „Fundamentals of permafrost“- „Geocryological forecast and ecological problems of geocryology“ has been prepared by a group of scientists, edited by L.S. Garagulya and E.D. Ershov (MSU, Geological Department).

- A unique Monograph on parametric drilling and core sampling through permafrost strata including a complete set of laboratory research was released under the name “Structure and properties of the frozen ground in the southern part of the Bovanenkovo gas-condensate field. Advice on the prevention of problems linked to cryogenic structures and gas blasts encountered during permafrost drilling and well operations”

(MSU, Geological Department).

- The monograph „Cryogenic metamorphism of rocks and underground waters „ by S.M. Fotiev has been prepared for publication. For the first time, the conditions and results of the cryogenic metamorphism of rocks and underground waters during the Late Cenozoic have been examined. The geocryological interpretation of the unique Baikal paleoclimatic sequence has been used to do so (ECI SB RAS).

- The monograph „Cryology of Mars and other planets of Solar System“ has also been prepared for publication (Geology Dept., MSU).

Anna Kurchatova (kanni@mail.ru)

## SPAIN

Several Spanish research teams are working on permafrost and periglacial processes in Spanish mountains, Antarctica and Andes, continuing previous work. Activities in 2009 focused on: Periglacial processes and environments in the Iberian Peninsula (Galician Mountains, Sierra Nevada, Cantabrian Mountains, Pyrenees and Central System); Permafrost and periglacial processes in Maritime Antarctic; and Martian permafrost.

Projects on Maritime Antarctic are focused on “Active layer Monitoring and Modelling”, from University of Alcalá, led by M. Ramos, and on “Geomorphic dynamic, permafrost mapping and periglacial environment”, led by J. López-Martínez (Universidad Autónoma de Madrid). Studies in Cantabrian Mountains have been carried out by the University of León Group, led by J.M. Redondo, and the University of Valladolid, led by E. Serrano, working especially in the Palentine Mountains and Picos de Europa massif. The University of Santiago de Compostela group, headed by A. Pérez-Alberti and M. Valcárcel, is working on nival and periglacial processes in the Galician Mountains, and on Crionival landforms in Southern Andes (Tierra de Fuego). In the Pyrenees two groups work on periglacial environments, one from the University of Zaragoza, led by Dr. J. Chueca, focusing on nival and thermal regimes and one from the University of Valladolid, headed by E. Serrano looking at permafrost and present day periglacial processes. The University of Barcelona group, led by A. Gómez-Ortíz, works in Sierra Nevada, where a Doctoral Thesis titled “Holocene Palaeoenvironmental reconstruction of The Sierra Nevada from sedimentary records” has been presented by M. Oliva. The Universities of Salamanca and Complutense of Madrid Group, led by R. Cruz and J. Pedraza are working on Quaternary periglacial landforms on Central System. The research team of the Universidad Complutense de Madrid, headed by D. Palacios, works in the Andean volcanoes, and a Doctoral Thesis titled “Climatic Change impact on glaciers of Nevado Coropiuana volcanic complex (Central Andes, South Perú)” has been presented by J. Úbeda. Finally, the Astro Biological Center (CAB) and the University of Alcalá work further on Martian permafrost.

From 21 to 24 June, 2009, the Second Iberian Congress of IPA took place in Sigüenza (Spain), organised by the University of Alcalá and coordinated by M. Ramos. This is a joint meeting between the Spanish and Portuguese Permafrost communities, a continuation of IPA-Spain ones, started in 1993. The congress



topic was “Periglacial environments, permafrost and climatic variability” with three main sessions: A) “Present-day dynamic in mountain periglacial environments”, B) “Iberian results during the International Polar Year (IPY)”, and C) “Permafrost like planetary cryospheric subsystem”. The meeting welcomed forty five participants, included three lectures (F. Nelson, H.W. Hubberten and G. Vieira). Twenty six oral presentations and eighteen posters were presented. Nineteen oral presentations and thirteen posters make the Spanish contribution. The II Iberian IPA Congress did finish with a fieldtrip in the Iberian Range Highlands. The next meeting, the Third Iberian Congress of IPA, will be organized by University of Santiago de Compostela (Spain) in Galice, June 2011, and coordinated by M. Valcárcel.



*Participants and invited lecturer in the Second Iberian Congress of IPA, held at Sigüenza (Spain), June 2009. (Photograph provided by Enrique Serrano)*

Enrique Serrano (serrano@fyl.uva.es).

## SWEDEN

At the University of Lund, The GeoBiosphere Science Centre continued/expanded activities in the Abisko area. The “Nordic centre for Studies of Ecosystem Carbon exchange and its interaction with the Climate system”(NECC) has got two monitoring sites in the area. A new installation for calibration of remote sensing data has been established at the Abisko-Jokka delta (Eklund / Schubert). The CARBOMONT project-“Effects of land-use changes on sources, sinks and fluxes of carbon in European mountain areas” and the ELSA project “Exchange processes between the land surface and the atmosphere” have activities in the Abisko area, especially in and around the Stordalen bog.

The old “IPA Abisko area active layer transect” is being maintained. J. Åkerman and M. Johansson are still maintaining 10 of the originally 12 CALM sites along the 100 km east-west transect.

The new boreholes - 6 and 16 meter deep drilled close to the old boreholes established in the 1980s by J. Åkerman continue to deliver data. Preliminary results show that the permafrost thickness is shrinking from below as well as from above. The snow manipulation experiment at a peat mire 6 km east of Abisko, northernmost Sweden is still running and the monitoring programme has this year been extended. At the manipulation site, projected future changes in snow depth are simulated and the impacts on permafrost and vegetation are being monitored. This summer, monitoring of greenhouse

gases (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O) was initiated by J. Bosjö (a new PhD student).“

The Arctic Council of Ministers has requested a report on the current status of various aspects of the Arctic’s Cryosphere. The major sections are the Greenland Ice Sheet, Arctic Sea Ice and the Terrestrial Cryosphere, which consists of the chapters Snow, Permafrost, Glaciers and Ice Caps, Hydrology. Sweden together with Canada is coordinating the terrestrial Cryosphere component and Sweden (T. Callaghan and M. Johansson) is leading the snow and permafrost chapters. The project will finish by the end of 2010.

A new project entitled “The Greenland Analogue Project” on Greenland’s west coast, east of Kangerlussuaq, has been initiated (L. Claesson Liljedahl and J.-O. Näslund). GAP is a multilateral project, which is funded by the Swedish, Finnish and Canadian Nuclear Fuel and Waste Management Companies (SKB, Posiva and NWMO). GAP involves researchers from universities and geological surveys in Sweden, Finland, Denmark, Canada, the United States and the United Kingdom. The project includes a subproject on groundwater chemistry/flow and permafrost in the bedrock by bedrock drilling. Two boreholes (220 and 340 meters) were drilled close to the ice sheet this summer. The boreholes are monitored for temperature, pressure and conductivity, and preliminary results indicate that the permafrost goes deeper than 300 meters at a distance of ca 500 meters from the ice sheet. The results from the bedrock drilling will be used in the planning of a deep bedrock drilling (ca 500-700 meters) close to the ice margin and in under the ice sheet, which will be drilled in order to study the groundwater flow, chemistry and permafrost conditions.

During the year we lost Dr. Richard Åhman, a well known Nordic Palsa specialist and Dr. Bo Malmström who worked with frost mounds and other periglacial forms in Sweden and Norway.

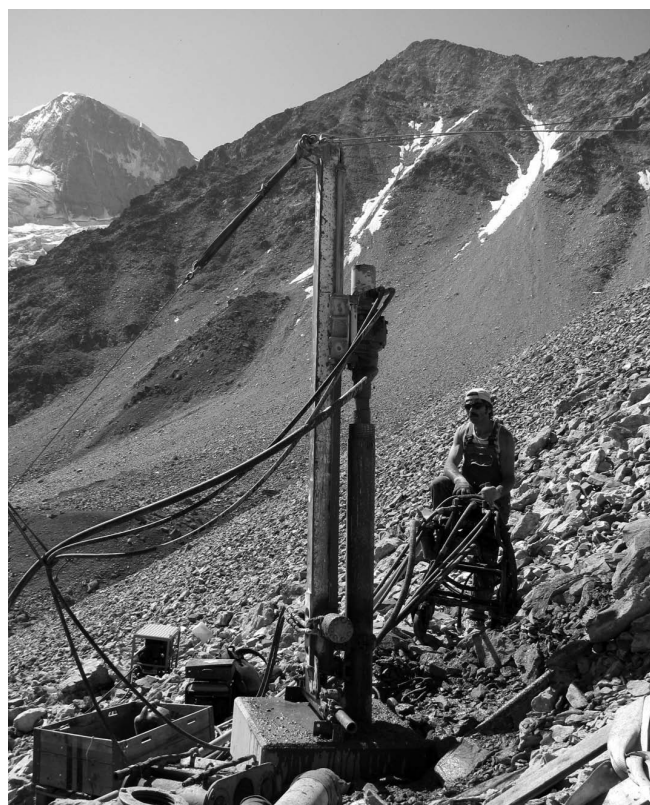
Jonas Åkerman (Jonas.Akerman@natgeo.lu.se).

## SWITZERLAND

PERMOS, the PERmafrost MONitoring Switzerland, has been further consolidated: In addition to the coordination office, a scientific committee was constituted and met three times. Besides elaboration of data policy, defining governance structures and ensuring quality, it conducted the re-evaluation of the “B”-ranked sites in fall 2009. Standards for the two types of sites, “Thermal Sites” and “Dynamic / Kinematic Sites” are being implemented step by step. As one part of the process, a questionnaire was published on [www.permos.ch](http://www.permos.ch) to receive information from the larger public, when rock fall were observed. Existing rock fall inventories form the base and are complemented by feedback from the questionnaire. In June, the Annual PERMOS meeting was held in Neuchâtel and included an excursion to the Jura permafrost site Creux du Van.

At the WSL Institute for Snow and Avalanche Research SLF ([www.slf.ch](http://www.slf.ch)), new practical guidelines for the construction of infrastructure in mountain permafrost were developed in collaboration with various partners; with a special emphasis on site selection and structure design with special technical solutions. The SLF permafrost monitoring network now

includes new instrumented boreholes under recently built mountain infrastructure such as pylons, buildings and defense structures. Temperature trends from older boreholes located in complex mountain topography in the Swiss Alps are being analyzed using specially developed Generalized Linear Models. At sites where reference data are available, 3D-laserscanning techniques are being tested to monitor creep, subsidence and erosion rates in different types of mountain permafrost terrain. Electrical Resistivity Tomography (ERT) surveys continued to be made on the Gemsstock ridge (with the University of Bonn). ERT monitoring were carried out (with the University of Fribourg within PERMOS) to observe the rapidly thawing ground ice at the Flüela Pass site, where one of the first Swiss permafrost investigations was carried out in the 1970's.



*Borehole drilling in Petit Mont Rouge talus slope, Arolla. (Photograph provided by Christophe Lambiel)*

The Institute of Geography of the University of Lausanne ([www.unil.ch/igul](http://www.unil.ch/igul)) concentrated its researches on two main topics: study of permafrost extension and characteristics in various alpine landforms and study of permafrost creep. Between September 2008 and 2009, nine new boreholes were drilled on three different talus slopes in the Valais Alps, within the permafrost belt: Petit Mont Rouge (Arolla), Les Attelas (Verbier, including borehole logging) and Les Lapires (Nendaz). Lapires is a joint project with the University of Fribourg. Geophysical surveys (ER and seismic tomography) were carried out with the University of Zurich. Automatic cameras were installed at all sites to observe references to internal air circulation in the scree slopes. Electromagnetic geophysics surveys (EM 31, IP and VLF-R) to map permafrost extent were applied in the Ticino Canton (Southern Swiss Alps). Investigations about relative and semi-absolute dating of alpine periglacial landforms using

the Schmidt Hammer were carried out in several sites of the northern and southern Swiss Alps. Movement, deformation and internal structure of creeping permafrost landforms (rock glaciers, frozen moraine) were studied using d-GPS, Terrestrial Laser Scanning (with the Institute of Geomatics and Risk Analysis of the University of Lausanne) and ERT.



*Sensor installation with Matterhorn in the background. Permasense wireless network. (Photograph provided by Jan Beutel)*

At the University of Zurich ([www.geo.uzh.ch/en/units/physical-geography-3g](http://www.geo.uzh.ch/en/units/physical-geography-3g)), a number of long-term projects involving modeling, measuring, and monitoring in mountain permafrost are being continued. Three new permafrost-related PhD projects have recently started: one concerning uncertainty and validation of physics-based permafrost models, one concerning statistical modeling of permafrost over the Alpine arc combined with local 2D/3D modeling, and one concerning sub-grid computation of permafrost and other cryosphere phenomena in mountains for application on continental scales. The Permasense wireless sensor networks on Matterhorn and Jungfrauoch are measuring and transmitting information on temperature, electric conductivity and crack dilatation. Additionally, the thaw of ice-filled clefts in bedrock is further investigated using laboratory experiments (with the Université de Caen, France). A collaboration with the SLF Davos, the Federal Institute for the Environment (FOEN), the Bavarian State Ministry for the Environment, and the Central Institute for Meteorology and Geodynamics (ZAMG) in Austria has started in the scope of the PermaNET project (Alpine Space, Interreg

III). Field sites were instrumented with temperature sensors and a database of alpine-wide permafrost evidences has been set up, which serves for the design and validation of statistical modeling. The occurrence of rock avalanches from glacierized and perennially frozen rock walls in the Central European Alps is investigated in a multi-scale approach. Detailed finite element stability modeling and analyses of high-resolution time-lapse DTMs are combined with regional-scale statistical analyses of detachment zones to evaluate the controlling factors for periglacial rock mass failures (in collaboration with University of Oslo and the ETH Zurich). Terrestrial survey were restarted on the rock glaciers Murtèl and Muragl (Grisons) to quantify permafrost creep rates on an seasonal to annual basis.

At the University of Fribourg, the Department of Geosciences ([www.unifr.ch/geoscience/geographie/en/index3.php](http://www.unifr.ch/geoscience/geographie/en/index3.php)) established three new “permafrost” faculties in September 2008 (Reynald Delaloye, Martin Hoelzle, Christian Hauck) building a new scientific group called “Alpine Cryosphere & Geomorphology”. The research focus includes mountain permafrost monitoring and modelling, using a variety of geophysical, geodetic and geomorphological methods, as well as subsurface modeling and coupling procedures to Regional Climate Models. Currently 3 PhD students and 2 PostDocs work on various topics ranging from ground-atmosphere modeling, effect of snow cover, geophysical monitoring to kinematics of rock glaciers and unstable permafrost slopes.

Daniel Vonder-Mühl (daniel.vondermuehl@systemsx.ch).

## UNITED KINGDOM

A symposium to celebrate Professor Charles Harris’ career was held on 25<sup>th</sup> September at the UMR CNRS 6143 „M2C“/ University of Caen, in Caen, France. Details of this happy and successful event are given in page 38 in this issue of Frozen Ground.



*Retrogressive thaw slump exposing huge syngenetic ice wedges that penetrate silt-sand of the Ice Complex (Yedoma) at Duvanny Yar, on the bank of the Kolyma River, Yakutia, NE Siberia. The plateau surface is about 40 m above river level. Person for scale. (Photograph provided by Julian Murton)*

Work has continued in establishing a chronology for the relict periglacial landscape of East Anglia. Through their application of cutting-edge luminescence dating methods Stephen Hitchens and Mark Bateman (Sheffield) have been able to discern from single samples multiple activation ages of both stripes and periglacial polygons, indicating polycyclic development of these features during Marine Isotope Stages 4–2. Stephen’s untimely death in September is a great loss to the UK periglacial community and he will be sorely missed.

Glacier-permafrost interactions associated with a Pleistocene ice sheet overriding permafrost ~430,000 years ago in Norfolk, Eastern England, were studied by an interdisciplinary team led by R. Waller (University of Keele) and comprising C. Whiteman (University of Brighton), E. Phillips and J. Lee (British Geological Survey) and J. Murton (University of Sussex). The structural attributes of stratified sand intraclasts within silty and clayey tills constrain the thermal conditions of glaciotectonic deformation. Analogous deformation structures in metamorphic rocks and glacially deformed permafrost in Arctic Canada support the hypothesis that the Norfolk structures did not form in an unfrozen deforming bed, as long thought, but in warm and ductile permafrost.

Ancient plant DNA preserved in permafrost soils was the focus of a UK-Danish-Russian field trip to Duvanny Yar on the lower Kolyma River, Yakutia, NE Siberia (See Figure). This Beringian type site preserves a record of terrestrial silt-sand (Yedoma) deposition during Marine Isotope Stages 3 and 2 (~50,000–10,000 years ago). Frozen cores of sandy silt were collected in a ~35-m high vertical transect through the Yedoma deposits by J. Haile (Universities of Copenhagen & Oxford), M. Edwards (University of Southampton) and J. Murton for DNA analysis, radiocarbon and optical dating, and sedimentological analyses.

The new Permafrost Laboratory at the University of Sussex is now in operation as a result of collaboration between Geography and Engineering at Sussex. A pilot experiment has been running since April to test the hardware and monitoring system, with a systematic experiment on rock fracture in mountain rockwalls planned.

Julian Murton (j.b.murton@sussex.ac.uk)

## UNITED STATES OF AMERICA

The 2009 Fall Meeting of the American Geophysical Union took place in San Francisco, California, December 14–18. Larry Hinzman, IARC Director and former U.S. Permafrost Association (USPA) board member, was invited to present the prestigious Nye Lecture on “Arctic Hydrology and the role of feedbacks in the climate system.” Approximately 200 talks and posters dealt with frozen ground, presented across virtually all AGU sections and focus groups. Presentations covered climate feedbacks and interactions, remote sensing and modeling techniques, geomorphology, environmental change, and many other topics. The USPA also held its annual meeting on 17 December during the 2009 AGU Fall Meeting. J. Rooney replaced Y. Shur as President. Coordinated by the new Permafrost Young Researchers Network (PYRN)-USPA liaison A. Liljedahl, the USPA established a USPA-PYRN

Educational Fund to provide long-term support for early career permafrost researchers. The effort is managed by a PYRN-USPA committee who provide advice to the USPA Board of Directors. 2009 USPA-PYRN initiatives included five partial travel grants to the 2009 AGU Fall Meeting, and a social networking and professional development event during AGU. Activities are announced through the website <http://pyrn.ways.org>.

The 2009 Annual Meeting of the Association of American Geographers took place March 22–27 in Las Vegas. The AAG's Cryosphere Specialty Group (CrSG) sponsored 14 sessions, including two sessions specifically on frozen ground, as well as sessions on cryospheric remote sensing, IPY, glaciers, water resources, and Arctic hydroclimatology. The annual CrSG awards were presented: H. J. Walker, Boyd Professor Emeritus at Louisiana State University, was recognized with the 2009 *Francois Emile Matthews Award*. The *R. S. Tarr Illustrated Student Paper Award* went to V. Chu of UCLA, for her presentation on "Rapid response of sediment plumes to Greenland ice-sheet surface melt."

T. Krzewinski reports ASCE's 14<sup>th</sup> International Specialty Conference on Cold Regions Engineering was held in Duluth, Minnesota, 30 August–3 September 2009: 70 papers were presented and published in conference proceedings. Awards were presented with D. Miller receiving the Harold R. Peyton Award, D. Kane the Can-Am Award, and T. Vinson as the Eb Rice Lecturer. Speakers included Representative Oberstar and President-Elect B. Leonard of ASCE. TCCRE Committee meetings were held at the conference. A number of meetings are planned: ISCORD 2010, from 1–5 June in Yakutia, Russia. ASCE will propose to host ISCORD 2013 in Anchorage, AK. ASCE's 15<sup>th</sup> International Specialty Conference on Cold Regions Engineering will be in 2011 in Quebec, joint with CSCE, organized by G. Doré. ASCE/TCCRE will cosponsor CSCE "Circum Polar Engineering Conference 2012," to be held in Yellowknife in September. TCCRE Committee meetings will be held in Las Vegas, in conjunction with AGU and USPA meetings in San Francisco in December of 2009, and in May 2010 in Seattle. TCCRE provided members for the Standards Committee, charged with updating the Standard on Frost Protected Shallow Foundations (FPSF). Recent rewrites were by Krzewinski and E. Clarke, and changes are being accepted by committee polling at this time. TCCRE has been representing ASCE in supporting a PBS Documentary "Building Alaska," to be released shortly. Krzewinski is leading ASCE efforts with B. Connor (UAF), K. Korri (ADOT), and T. Brooks (Alaska Railroad). Recently shown as a part of the Anchorage Film Festival, the film will air on PBS in late 2009.

T. Zhang and the permafrost group at the National Snow and Ice Data Center at the University of Colorado in Boulder (O.W. Frauenfeld, K. Schaefer, B. Sheffield, R. Jin, M. Parsons, R. Armstrong, L. Liu, Z. Fan, J. Wahr, and R.G. Barry) continue work on many aspects of frozen ground. Frauenfeld has accepted an appointment in the Geography Department at Texas A&M University, but continues to collaborate with Zhang on investigating changes in permafrost temperatures, active layer thickness, and depth of seasonally frozen ground using soil temperature data from 400+ stations across Russia. With Q. Wu (CAREERI), Zhang is also studying permafrost

changes over the Qinghai-Tibetan Plateau. With support from NSF and IARC/NSF, daily snow depth and soil temperature acquisition from the Russian high latitudes is in progress. Using InSAR data, surface deformation over permafrost is detected on the North Slope of Alaska (Liu, Zhang, and Wahr). The NSIDC Frozen Soil Algorithm is being further developed, validated, and calibrated using surface soil temperature data from Russia, China, and U.S. (Zhang, Jin, and Armstrong). Under NASA, NSF, and IARC/NSF funding, permafrost samples from 7 boreholes to 2.9 m were taken in Fairbanks and the North Slope of Alaska in summer 2009 for carbon studies (Zhang, Schaefer, and Liu) with USGS-Boulder. A NASA-funded modeling project studies permafrost carbon in the Arctic (Schaefer and Zhang). A one-dimensional model of water and heat transport in boreal soils with freezing and thawing was developed to simulate soil response to climate change (Fan and Zhang). Zhang and Parsons continue to describe global permafrost distributions and statistics using the IPA permafrost map and other available data. With NASA support, "All About Frozen Ground" (<http://nsidc.org/frozenground/>) was developed and is available as a public resource (Sheffield and Zhang).

K. Yoshikawa reports on the Permafrost/Active Layer Outreach Program, which builds on work begun in 2005 to establish long-term permafrost and active layer monitoring sites adjacent to schools in Alaska and other countries including tropical high mountains such as Kilimanjaro, Tanzania. Monitoring stations are located at the over 150 Alaskan schools/communities. The sites collect permafrost temperature data and active layer depth. Data gathered from these stations are shared with other schools and made available to the public through: <http://www.uaf.edu/permafrost/>. This project involves more than 10,000 students and 500 teachers across Alaska. Specialists in outreach education are developing a classroom lesson Permafrost/Active Layer in Alaska that will be included in a "Tunnel Man" movie series. Activities and teaching materials in the Permafrost Handbook encourage students to collaborate and communicate new ideas.



*Permafrost temperature monitoring at the village of Kwigillingok, 59° 52' 37.67" N, 163° 9' 32.70" W. (photograph provided by Kenji Yoshikawa)*

Parsons received the AGU Charles S. Falkenberg Award, presented jointly by AGU and the Earth Science Information Partnership (ESIP). The award honors Parsons as „a scientist under 45 years of age who has contributed to the quality of life, economic opportunities, and stewardship of the planet

through the use of Earth science information and to the public awareness of the importance of understanding our planet.



*Snow mobile traverse in western Alaska spring 2009, drilling at Eek. (photo provided by Kenji Yoshikawa)*

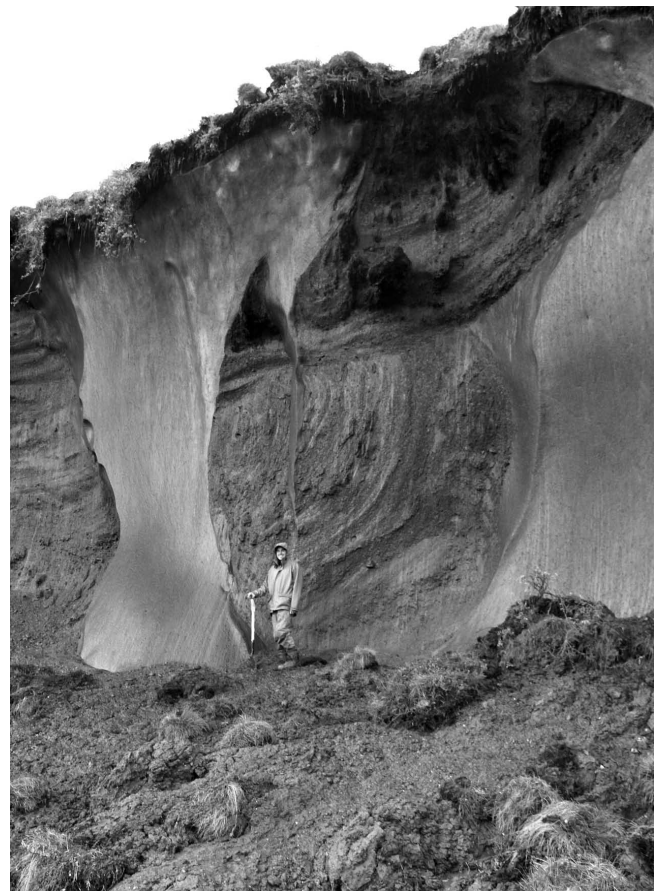
W. Eisner (University of Cincinnati), with collaborators C. Cuomo (University of Georgia) and K. Hinkel, reports on “Connecting Indigenous Knowledge to Landscape Process Research, Arctic Coastal Plain of Alaska.” The classification of 260 records from the Iñupiaq Knowledge GIS is reported in “Advancing Landscape Process Research through the Incorporation of Iñupiaq Knowledge” (Eisner et al. in press at Arctic). The entire data suite (GIS layers, videotaped interviews, and related archived data) will be part of a web-based GIS, to be included in a website of resources, research, and information related to indigenous and local community knowledge in northern Alaska, and collaborations between scientists and indigenous communities more generally. They presented their GIS data to the Barrow community in the form of a day-long workshop in June 2009, which generated lively feedback from the 40 attendees, including over 20 Iñupiaq elders.

K. Hinkel (University of Cincinnati), J. Lenters (University of Nebraska), Y. Sheng (UCLA), and their students continued surveying lakes on the North Slope of Alaska. 2009 summer work was concentrated near Atqasuk, ~100 km inland from Barrow. Research components included (1) surveying lake shores with DGPS to determine shoreline changes between mid-June and mid-August, and correlating changes with measured drop in water depth and lake volume; (2) mapping lake bathymetry and collecting summer temperature profiles from lakes; and (3) modeling the energy and water balance of instrumented “focus” lakes near Barrow and Atqasuk. Graduate student B. Winston has been analyzing archived satellite images to verify that some lakes consistently experience ice melt-out earlier than surrounding lakes, and that lake ice melt-out occurs later in a wide Arctic littoral zone due to lower temperatures and cloudy/foggy conditions in late spring.

The permafrost group at the University of Delaware (UD) has undergone significant changes during the past year. K. Shiklomanov has accepted a professorial appointment in the Geography Department at George Washington University (GWU) in Washington DC. In August 2009 the Circumpolar Active Layer Monitoring (CALM) program received a five-year award from the U.S. National Science Foundation, and

will be a component of the Arctic Observing Network. This new CALM III will be administered jointly through GWU and UD, with Shiklomanov acting as project director and Nelson as co-principal investigator. UD doctoral students D. Streletskiy and M. Demitroff are making good progress, with dissertation research focused on active-layer studies in northern Alaska and fossil periglacial features in the Mid-Atlantic region, respectively. New graduate students who will be involved in CALM III include C. Marquez (GWU) and A. Campbell (UD). The 2009 field parties in northern and western Alaska included Shiklomanov, Nelson, A. Klene (University of Montana), C. Seybold (U.S. Natural Resources Conservation Service), Streletskiy, Marquez, Campbell, and L. Polyakova (Moscow State University).

T. Osterkamp reports on his project “Physical and Ecological Changes Associated with Warming Permafrost and Thermokarst in Interior Alaska,” in collaboration with M.T. Jorgenson, E.A.G. Schuur, Y.L. Shur, M.Z. Kanevskiy, J.G. Vogel, and V.E. Tumskoj. They are currently summarizing their observations and measurements of physical and ecological changes at a tundra site near Healy, AK. Air temperatures decreased (1985–1999) while permafrost warmed and thawed, creating thermokarst terrain probably as a result of increased snow depths. Thermokarst-induced changes in relief alter the near-surface hydrology and ecological processes, especially on vegetation.



*Ice wedges exposed along the Colville River on the North Slope, June 2009. (Photograph provided by Guido Grosse)*

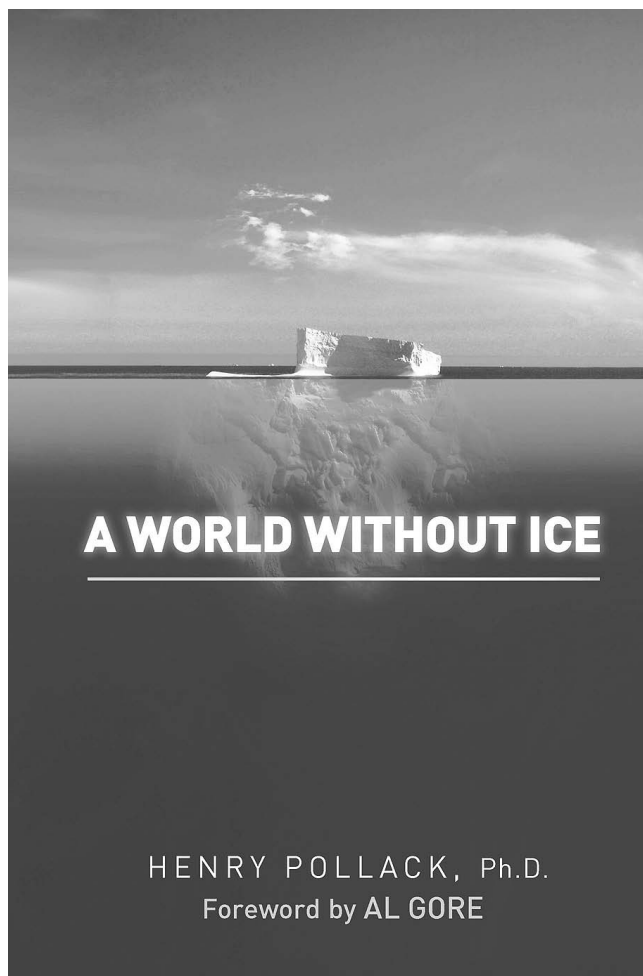
K. Bjella, on behalf of the Cold Regions Research and Engineering Lab, reports on studies at the Permafrost Tunnel in Fox, AK, including electrical resistivity and GPR studies by the Southwest Research Institute, tunnel roof support load and creep analysis by CRREL, ice wedge isotope analysis by UNLV and D. Lawson. The University of Alaska, Institute of Northern Engineering is conducting a study at the Fairbanks Permafrost Research Station, aka Farmers Loop Road Site, for lateral loading of pipe piles. Bjella also reports on the installation of a 12 m thermistor cable at Thule, Greenland, to investigate the state of the permafrost and the effect on infrastructure. B. Astley and Bjella conducted an Army-funded demonstration on Fort Wainwright of permafrost delineation techniques (DC resistivity, capacitively-coupled resistivity, ground-penetrating radar, electromagnetics, and frost probing) to be used in future site selection and geotechnical surveys on military installations underlain by permafrost.

N. Mölders and D. PaiMazumder (University of Alaska Fairbanks) examined how the design and density of a permafrost network may affect regional climatology calculated therewith. Biases most likely occur in mountainous regions. Mölders and Kramm wrote a review book chapter on the status of treating permafrost in climate, numerical weather prediction, and chemistry transport models, and how to improve the permafrost representation in these models.

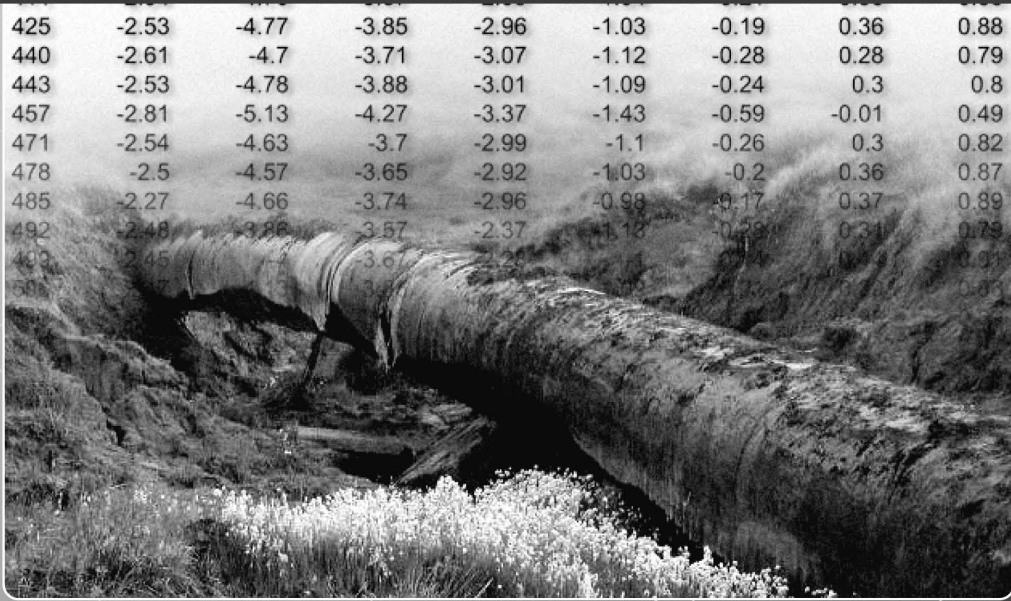
V. Romanovsky reports for the growing UAF permafrost group at the Geophysical Institute/International Arctic Research Center (K. Yoshikawa, S. Marchenko, R. Daanen, G. Grosse, A. Kholodov, and R. Muskett). They continue work on projects including permafrost and active layer dynamics within Alaska, instrumentation of boreholes, acquisition of subsurface temperatures from circum-arctic permafrost regions (Thermal State of Permafrost, TSP), and the modeling of permafrost in various regions: Alaska, Siberia, and Greenland. Permafrost spatial dynamics, implemented by Marchenko for an Alaskan permafrost domain, use a high-resolution spatial data set (2x2 km) and Scenarios Network for Alaska Planning (SNAP) data for climate forcing (<http://www.snap.uaf.edu>) derived from five GCMs: ECHAM5, GFLD21, MIROC, HADLEY, and CCCMA using the A1B emissions scenario. G. Grosse continued fieldwork within NASA and NSF projects in the northern lowlands of the Seward Peninsula, AK, with K. Walter Anthony (UAF), L. Plug (Dalhousie University), M. Edwards (University of Southampton), L. Slater (Rutgers), and N. Bigelow (UAF), and together with B. Jones (UAF/USGS) and K. Peterson (UAA) along a transect of the Colville River (Alaska North Slope). Additional field work took place in eastern Siberia with S. Zimov (Northeast Science Station Cherskii). B. Jones completed remote sensing analyses of thermokarst lake dynamics on the Seward Peninsula, AK, and M.S. student M. Tillapaugh is completing her thesis on remote sensing of thermokarst lakes dynamics in the Kolyma lowland (Siberia). R. Daanen continues simulating permafrost conditions in Greenland and Alaska (NSF-funded). Results from 25 km resolution Greenland permafrost simulations are used to project degradation from infrastructure development; similar simulations for Alaska are available online. He continues EPSCoR-funded work on debris glacier-like features in the Brooks Range. A new DOE study has started, forecasting soil

freezing rates in northern Alaska, and new outreach efforts were established with the Watershed School of Fairbanks, teaching fifth graders about the permafrost life cycle. Part of TSP, the GI permafrost group collaborated with Russian, Kazakh, and Mongolian colleagues to update their national Permafrost Monitoring Networks, resulting in many new and improved sites. R. Muskett continued work on space geodesy and remote sensing of the northern hemisphere (MODIS, ICESat, GRACE, and AMSR-E) with an emphasis on water equivalent mass changes of Eurasian and North American watersheds as related to permafrost changes.

H. Pollack of the University of Michigan reports on the publication of his new book titled "A World Without Ice." The book is a tale of climate change and people, told through the prism of ice. Published by Penguin and with a foreword by Al Gore, the book describes the role of ice in the development of Earth's landscape, climate, and human civilization, and the reciprocal impact of people on the planet's ice. It describes the delicate geological balance between ice and climate, and why the rapid disappearance of ice portends serious consequences in our not-so-distant future. For more information, see [www.worldwithoutice.com](http://www.worldwithoutice.com).



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# OTHER NEWS

## CHARLES HARRIS SYMPOSIUM

A symposium that celebrated Professor Charles Harris' contributions to permafrost and periglacial research was held on 25<sup>th</sup> September 2009 at UMR Centre national de la recherche scientifique 6143 „M2C“ / University of Caen, France.

Charles retired in August 2008, after a long and distinguished career of periglacial and permafrost research, and teaching at Cardiff University. His research has focused on periglacial slope processes, integrating field monitoring, laboratory experiments and Quaternary geology. More recently, he has led a major project on permafrost and climate in Europe (PACE), and for many years has been a leader of periglacial geomorphology in the UK and Europe. He is a past Vice-President of the International Permafrost Association, and is currently an associate editor of the journal *Permafrost and Periglacial Processes*.

The symposium was organized by Julian Murton and Marianne Font on behalf of the IPA Working Group on *Periglacial Landforms, Processes and Climate* and the *British Permafrost and Periglacial Association*. The symposium brought together more than 20 permafrost and periglacial scientists from France, Switzerland, Germany, Norway, Canada, Japan and the UK. Absent friends from Svalbard, New Zealand, Canada and Wales sent messages of good wishes for Charles' retirement.



Participants of the Charles Harris Symposium in Caen, France. (Photograph provided by Julian Murton)

By way of introduction, Hans-Wolfgang Hubberten, on behalf of the IPA, thanked Charles for his contribution to permafrost science & the IPA. Antoni Lewkowicz then provided an illustrated summary of Charles' research, spanning trips to Norway, Arctic Canada, Svalbard and the wilds of Wales.

The symposium comprised four themes that demonstrate the breadth of Charles' research contribution:

### *Theme 1: Arctic Monitoring & Laboratory Modelling*

- Field-laboratory integration of solifluction processes (Charles Harris)
- Solifluction modelling (Martina Kern-Lütschg)
- Permafrost borehole monitoring in Scandinavia and Svalbard (Ketil Isaksen recording)

### *Theme 2: Mountain Permafrost*

- Rock falls from icy slopes (Wilfried Haeblerli)
- Setting up long-term monitoring of mountain permafrost (Dani Vonder Mühl)
- Monitoring and modelling strategy of mountain permafrost in Norway and Iceland (Bernd Etzelmüller)

- The shallow subsurface in mountain permafrost (Stephan Gruber)

- Rock fissure experiments (Andi Hasler)

### *Theme 3: Instrumentation, Geophysics & Geotechnics*

- Combining visual and instrumental observations of periglacial soil movements (Norikazu Matsuoka)
- New geophysical monitoring strategies on permafrost and interpretation models (Christian Hauck)
- Geotechnical impacts of contemporary climate change on Siberian permafrost (Chris Martin)

### *Theme 4: Quaternary Science*

- Re-evaluating the origins of Quaternary ramparted depressions in Wales (Neil Ross)
- Carno revisited - a detailed investigation of upland slope terrace features in mid-Wales (Adrian Humpage)
- Identification of Younger Dryas outburst flood path from Lake Agassiz to the Arctic Ocean (Julian Murton)

A number of these presentations will be published in a special issue of *Permafrost and Periglacial Processes* dedicated to Charles.

After the talks, Charles was presented with a retirement cake by Della Murton. Following this, a tour of the cold-room facilities and introduction to recent periglacial experiments was led by Marianne Font & Andi Hasler. Here Charles has worked since the late 1980s, carrying out a series of pioneering experiments in collaboration with colleagues from Caen, and it was very nice to celebrate this day with Jean-Pierre Coutard, Jean-Pierre Lautridou and Jean-Claude Ozouf. Afterwards, dinner was held in a local restaurant. In all, this was a stimulating and very happy occasion, and it was appropriate to share it with Charles' colleagues from Caen and elsewhere. We all wish Charles and his wife, Sue, a long and happy retirement in South Wales.

Julian Murton and Marianne Font

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## CRYO-EX: IPY TERRESTRIAL CRYOSPHERE SCIENCE WORKSHOP, UNIVERSITY OF OTTAWA, OCTOBER 16-19, 2009

More than 50 students and senior researchers attended a very successful workshop on the terrestrial cryosphere at the University of Ottawa, Canada in late October, 2009. The meeting, which was organized by Antoni Lewkowicz at the University of Ottawa and Bernd Etzelmüller at the University of Oslo, had representation from Canada, Norway, the USA, Germany and Portugal. It was sponsored by the Faculty of Arts at the University of Ottawa and Cryo-Ex (<http://www.geo.uio.no/cryoex/>), an exchange program for faculty, undergraduate and graduate students at Oslo, Ottawa and Carleton universities and the University Centre in Svalbard, who focus their studies on permafrost or glaciers. Cryo-Ex is funded by a grant from the Norwegian Centre for International Cooperation in Higher Education. Social events included a reception at the Norwegian Ambassador's residence in Ottawa, three well-attended dinners in local restaurants and a visit to some spectacular glacially-



sculpted bedforms exposed in a nearby quarry. The IPA Executive Committee met at the University of Ottawa on the day after the end of the workshop.



*Participants of the Cryo-Ex: IPY Terrestrial Cryosphere Science Workshop. (Photograph provided by A. Lewkowicz)*

The first day of the workshop focused on results obtained in Cryo-Ex and included a panel discussion on international cooperation among the partner universities. The scientific program on the following day started with a joint session covering the main results achieved in the International Polar Year for the four projects of the IPA (TSP, ANTPAS, CAPP and ACCO-net) and in the Glaciodyn project. The glaciologists and permafrost specialists then continued their discussions separately with presentations from individual studies, many given by graduate students involved in the projects. The permafrost group spent a final half-day undertaking detailed content planning for a special issue of Permafrost and Periglacial Processes that will be produced for the Oslo IPY Conference and EUCOP-3 in June 2010. This issue is expected to include results from all four IPA IPY projects with special emphasis on the Thermal State of Permafrost, as well as short communications on permafrost conditions outside the polar regions. It is planned to represent the first part of the legacy of the IPA within the IPY.

Antoni Lewkowicz and Bernd Etzelmüller  
(alewkowi@uottawa.ca)

## SUCCESSFUL GAPHAZ GLACIER AND PERMAFROST HAZARD WORKSHOP IN VIENNA

From 10 – 13 November 2009 the joint working group on glacier and permafrost hazards in mountains (GAPHAZ) by IPA and the International Association for the Cryospheric Sciences (IACS) held its first international workshop in Vienna. The workshop was locally organized and hosted at no costs at the University of Natural Resources and Applied Life Sciences, Vienna (BOKU), by Prof. Jean Schneider, his secretary Friederike Hintermüller and their team. The workshop dinner was sponsored by the city of Vienna. Around 80 participants from all continents with glaciers and permafrost joined the workshop. The number of participants was for logistical reasons limited to 80 and registration has been closed after this number was reached.

During the first workshop day a group consisting of the organizing committee, the advisory board, the keynote speakers, and the session chairs met and discussed questions and topics to be particularly followed up during the workshop. The second and third workshop day consisted of a small number of keynotes and according extensive discussion slots in the mornings. In the afternoon, four to five parallel breakout groups discussed topics of particular importance or interest. The group findings were then presented and discussed in the plenum. At the end of the second and third workshop day the about 40 submitted posters were shortly presented in the plenum, followed by poster-viewing sessions. During the final workshop day the extended committee discussed further steps and outputs from the workshop, fundamental scientific questions arising and the future of the GAPHAZ working group. Preparation of a press release was started.

The highly successful workshop was characterized by extraordinary open, motivated and constructive plenum and group discussions, not least triggered by the high quality of the extensively prepared keynotes and posters. A number of research gaps was identified and the need for a hazard management manual for practitioners stressed. The compilation of such a manual and the preparation of summarizing scientific publication based on the workshop were decided. Among the most eye-opening conclusions from the workshop was the – often underestimated – socio-demographic dimension of high mountain hazards. The vulnerability of a society against a certain physical stress may vary hugely over the globe. Examples during the workshop showed how comparably small and internationally not registered events may through long-term socio-demographic interactions develop into – again internationally not registered – major disasters.

Details on the workshop including PDFs of most contributions can be found on the workshop webpage which is linked from the GAPHAZ webpage [www.geo.uio.no/remotesensing/gaphaz](http://www.geo.uio.no/remotesensing/gaphaz)

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## PYRN ACTIVITIES





In 2009, a new group took over the management of the network and faced the responsibility, the honour, and challenge in continuing to improve PYRN as a capable and encouraging


forum for early career scientists. The executive committee as of November 2009 is, represented by A. Abramov, P. Bonnaventure, S. Hachem I. Gärtner-Roer, A. Liljedahl, and L. Lynn.

The community of PYRN members has grown steadily and crossed the number of 700 members in autumn 2009 representing 43 different countries. The exchange is mainly supported by the website (<http://pyrn.ways.org/>), where jobs, upcoming conferences, as well as articles are posted. In addition, newsletters and special announcements are sent out via email. A major component of the website is the activity of single members by posting blogs, comments, images, etc.

PYRN is involved in a number of events throughout the year. One highlight was the General Assembly of the European Geosciences Union (EGU) in April 2009, where PYRN organized a social gathering that was attended by 35 PYRN members and presented a poster (Johansson et al.: Permafrost young researcher get their hands dirty: the PYRN Thermal State of Permafrost IPY Project).







## PYRN-Bib

**A Bibliography of Permafrost theses sponsored by the Permafrost Young Researchers Network**

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**PYRN-Bib now hosts more than 900 entries from 22 countries covering the period 1951-2009**

**PYRN-Bib is online:**  
<http://pym.ways.org/resources/pym>

**PYRN-Bib can be downloaded in various formats: tagged Endnote library, XML, BibTex, PDF**

**PYRN-Bib accepts anytime new relevant theses and old theses not yet catalogued**

In October, the first PYRN – Russia Workshop entitled: “PYRN in Russia: from frozen to thawed state” was held in Puschino. A group of about 25 scientists discussed the role of Young Permafrost Researchers in Russia and planned future events. At the American Geophysical Union Fall Meeting 2009, San Francisco, PYRN together with the US Permafrost Association (USPA) organized financial travel support to five US based PYRN members through a competitive process. In addition, USPA sponsored the USPA-PYRN Breakfast Forum, which aim was to support the exchange between PYRN and USPA members and to provide early career permafrost researchers a chance to find out about professional and research career opportunities/challenges in the US. PYRN would like to encourage all members to use the opportunity to benefit from the network and to promote the skills and expertise of young scientists in the permafrost community.



*Participants of the PYRN Russia Workshop held in Puschino in October 2009. (Photograph provided by Andrey Abramov)*

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# PUBLICATIONS

## **Structure and properties of permafrost sediments of the Southern part of the Bovanenkovo gas field.**

Chuvilin E.M., Perlova E.V., Baranov Yu.B., Kondakov V.V., Osokin A.B., Yakushev V.S. Moscow, GEOS, 137 pp.

This monograph proposes a comprehensive description of parametric drilling and core sampling in permafrost environments and includes a large set of laboratory analyses. It provides timely information on the prevention and mitigation of hazards encountered during permafrost drilling and well operations.

## **Permafrost Ecosystems - Siberian Larch Forests.**

A. Osawa., O.A. Zyryanova, Y. Matsuura, T. Kajimoto, R.W. Wein, (Eds.) Ecological Studies, Vol. 209. Approx. 540 pp. ISBN: 978-1-4020-9692-1.

Drawing from a decade-long collaboration between Japan and Russia, this important volume presents the first major synthesis of current knowledge on the ecophysiology of the coniferous forests growing on permafrost at high latitudes. It presents ecological data for a region long inaccessible to most scientists, and raises important questions about the global carbon balance as these systems are affected by the changing climate. This authoritative text provides a comparison of these forests in relation to boreal forests elsewhere, and concludes with an assessment of the potential responses of this unique biome to climate change.

## **Cold Regions Engineering 2009: Cold Regions Impacts on Research, Design, and Construction.**

J. J. Hinzmann, H. D. Mooers (Eds.) ASCE, 648 pp. ISBN: 9780784410721.

These proceedings contains 62 peer reviewed papers presented at the Cold Regions Engineering 2009 conference held in Duluth, Minnesota, from August 31 to September 2, 2009. This book examines a variety of issues associated with cold regions engineering including: climate change, construction, frost action, green engineering, pavement, railroads, sewage treatment facilities. The papers collected here analyze the latest topics in cold regions engineering from countries such as the United States, Canada, Russia, China, Denmark, Japan, and Iran.

## **New Permafrost and Glacier Research.**

M. I. Krugger and H. P. Stern (Eds.), Nova Publishers, 312 pp. ISBN: 978-1-60692-616-1.

This book presents the latest research on both permafrost and glaciers, with chapters on permafrost modelling, permafrost engineering, permafrost microbiology and permafrost geomorphology.

**Periglacial and Paraglacial Processes and Environments.** J. Knight and S. Harrison (Eds.) Geological Society Pub House, 272 pp. ISBN: 1862392811.

Periglacial and paraglacial environments, located outside ice sheet margins but responding to similar climate forcings, are key to identifying climate change effects upon the Earth system. Papers in this volume explore some of these interrelated issues in field studies from Europe, North America and Asia. The volume will be of interest to geomorphologists, modellers, environmental managers, planners and engineers working on landscape, climate and environmental change in periglacial and paraglacial areas.

## **Thermosyphon for Permafrost Protection.**

J. Xu, VDM Verlag, 178 pp., ISBN: 3639176502.

This work presents an analytical and numerical model of a long inclined two-phase closed thermosyphon, known as a hairpin thermosyphon, which is representative of a new configuration for thermosyphons used in arctic applications. The thermosyphon has been approved effective in protecting a recently built road project near Fairbanks Alaska. A laboratory experiment and a full scale road experiment along with associated modeling are described in the book.

## **A World Without Ice.**

H. Pollack. Avery, 304 pp. ISBN: 1101148748.

This book examines the effects of global warming by looking carefully at the potential consequences of a world without ice. The author traces the effect of mountain glaciers on supplies of drinking water and agricultural irrigation, as well as the current results of thawing permafrost and shrinking Arctic sea ice.

## **Permafrost Monitoring.**

Pavlov A.V. Novosibirsk, Academic Publishing House. "Geo", pp. 168–188.

# PLANNING CALENDAR

The following meetings share common interests with the IPA Membership and Working Parties. The list is not all inclusive, but is intended to help avoid overlaps in scheduling future IPA and other international meetings. Please send corrections and additions to the IPA secretariat ([contact@ipa-permafrost.org](mailto:contact@ipa-permafrost.org)).

## 2010

March 10-13, 40th International Arctic Workshop, Winter Park Mountain Lodge, Colorado, USA ([instaar.colorado.edu/aw](http://instaar.colorado.edu/aw))

March 16-19, State of the Arctic Conference, Miami, Florida, USA ([soa.arcus.org](http://soa.arcus.org))

April 15-19, Arctic Science Summit Week, Nuuk, Greenland ([www.assw2010.org](http://www.assw2010.org))

May 2-7, EGU-2010 European Geosciences Union General Assembly, Vienna, Austria

June 1-5, International Symposium on Cold Region Development ISCORD 2010, Yakutsk, Republic of Sakha, Russia ([www.coldregion2010.com](http://www.coldregion2010.com))

June 4-11, 4th International Workshop on Ice Caves, Obertraun, Austria ([www.iwic2010.info](http://www.iwic2010.info))

June 8-12, IPY Oslo Science Conference, Oslo, Norway ([www.ipy-osc.no](http://www.ipy-osc.no))

**June 13-17, Third European Conference on Permafrost (EUCOP III), UNIS, Longyearbyen, Svalbard, Norway ([www.eucop2010.no](http://www.eucop2010.no))**

June 14-18, 23rd Polar Libraries Colloquy, Bremerhaven, Germany ([arcticcentre.ulaplantland.fi/polarweb/plc/pubs.asp](http://arcticcentre.ulaplantland.fi/polarweb/plc/pubs.asp))

August 1-6, 19th World Congress of Soil Science, Brisbane, Queensland, Australia ([www.ccm.com.au/soil](http://www.ccm.com.au/soil))

August 3-6, XXXI SCAR Science Week, including 4th Open Science Conference, Buenos Aires, Argentina ([www.scar.org/conferences](http://www.scar.org/conferences))

September 12-16, 2010 6th Canadian Permafrost Conference, Calgary, Canada ([www.geo2010.ca](http://www.geo2010.ca))

December 13-17, American Geophysical Union Fall Meeting, San Francisco, California, USA; U.S. Permafrost Association Annual Meeting ([www.uspermafrost.org](http://www.uspermafrost.org))

## 2011

March 28 - April 1, IASC Arctic Science Summit Week, including 2nd Open Science Conference, Seoul, Korea ([www.assw2011.org](http://www.assw2011.org))

April 2-7, EGU-2011 European Geosciences Union General Assembly, Vienna, Austria

June 27- July 8, IUGG XXV General Assembly, Melbourne, Australia ([www.iugg2011.com](http://www.iugg2011.com))

July 20-27, XXVIII INQUA Congress, Bern, Switzerland ([www.inqua2011.ch](http://www.inqua2011.ch))

December 12-16, American Geophysical Union Fall Meeting, San Francisco, California, USA; U.S. Permafrost Association Annual Meeting ([www.uspermafrost.org](http://www.uspermafrost.org))

## 2012

April 22-27, IPY 2012 Conference: From Knowledge to Action

**June 25-29, Tenth International Conference on Permafrost, Tyumen, Russia ([www.ticop2012.org](http://www.ticop2012.org))**

August 2-10, 34th International Geological Congress, Brisbane, Queensland, Australia ([www.34igc.org](http://www.34igc.org))

August 12-25, IGU Congress, Cologne, Germany ([www.igu-net.org](http://www.igu-net.org))

July 16-19, XXXII SCAR Science Week, including 5th Open Science Conference, Portland, Oregon, USA ([www.scar.org/conferences](http://www.scar.org/conferences))



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## DECEMBER 2009

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**International Permafrost Association**  
**International University Courses on Permafrost**  
[www.ipa-permafrost.org](http://www.ipa-permafrost.org)



International Polar Year  
[www.ipy.org](http://www.ipy.org)



Global Terrestrial Network For Permafrost  
[www.gtnp.org](http://www.gtnp.org)



Antarctic Permafrost and Soils  
[earth.waikato.ac.nz/antpas](http://earth.waikato.ac.nz/antpas)



Carbon Pools in Permafrost Regions  
[www.geowiss.uni-hamburg.de/i-boden/capp](http://www.geowiss.uni-hamburg.de/i-boden/capp)



Arctic Circum-Polar Coastal Observatory Network  
[www.arcticportal.org/acd/acconet](http://www.arcticportal.org/acd/acconet)



Arctic Coastal Dynamics  
[www.arcticportal.org/acd](http://www.arcticportal.org/acd)



Permafrost Young Researcher Network  
[pyn.ways.org](http://pyn.ways.org)



Frozen Ground Data Center  
[nsidc.org/fgdc](http://nsidc.org/fgdc)



Circumpolar Active Layer Monitoring  
[www.udel.edu/Geography/calm](http://www.udel.edu/Geography/calm)



Glacier and Permafrost Hazards in Mountains  
[jern.uio.no/remotesensing/gaphaz](http://jern.uio.no/remotesensing/gaphaz)

**THIRD EUROPEAN CONFERENCE  
ON PERMAFROST (EUCOP III)  
JUNE 13-17, 2010, SVALBARD,  
NORWAY**



**[www.eucop2010.no](http://www.eucop2010.no)**

September 12-15, 2010  
Canadian Permafrost Conference  
Calgary, Canada

**25-29 June 2012**  
**Tenth International Conference  
on Permafrost**  
**Tyumen, Russia**

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