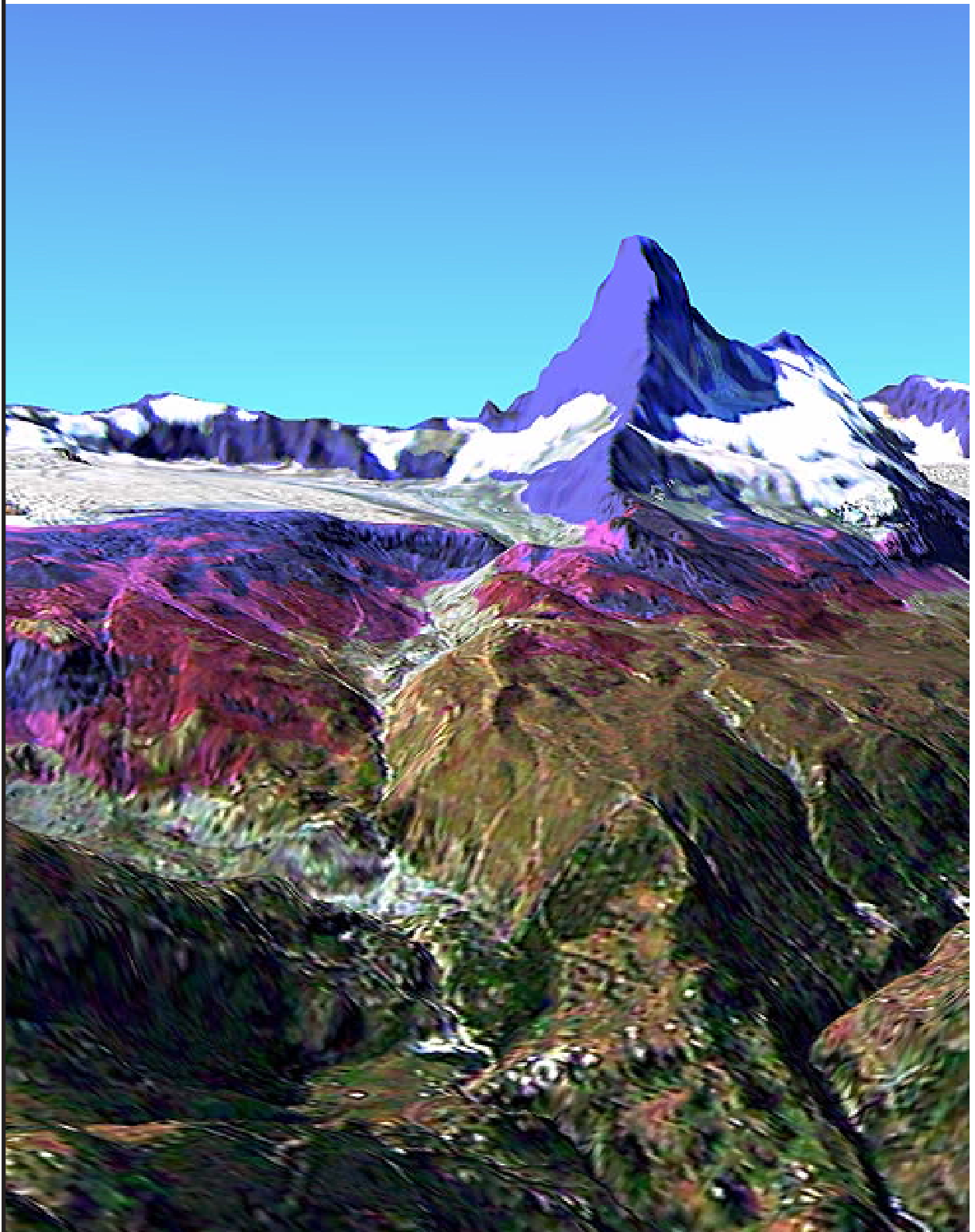


# FROZEN GROUND



The News Bulletin of the International Permafrost Association

Number 27, December 2003



## 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 adhering national or multinational organisations or as individuals in countries where no Adhering Body exists. The IPA is governed by its officers and a Council consisting of representatives from 23 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 in July 1989. 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 programs 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, and in Zurich, Switzerland, 2003. The ninth conference will be in Fairbanks, Alaska, in 2008. Field excursions are an integral part of each Conference, and are organised by the host country.

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*Cover: Permafrost occurrence at Matterhorn, Swiss Alps, simulated using a numerical model for spatial permafrost distribution (blue – permafrost occurrence probable, red – permafrost occurrence possible) based on solar radiation, air temperature and field evidence. The houses in the foreground belong to the village of Zermatt, the bright forest-free zone to the lower left is the now ice-free forefield of Gorner Glacier and the glacier at the upper left is Theodul Glacier. The visualization is a combined effort of the Glaciology and Geomorphodynamics Group (Stephan Gruber, permafrost modelling) and the Remote Sensing Laboratories (Stefan Biegger, computer graphics) within the Geography Department, University of Zurich, Switzerland. Sources: Satellite imagery—ESA/Eurimage®, CNES/Spotimage, swisstopo/NPOC. DEM25: 2003 swisstopo® (BA035793).*

# FROZEN GROUND

THE NEWS BULLETIN OF THE  
INTERNATIONAL PERMAFROST ASSOCIATION  
NUMBER 27 • DECEMBER 2003

*Frozen Ground*, the News Bulletin of the International Permafrost Association, is currently published annually.

The IPA is a non-governmental association of national organisations representing 24 countries or groups of 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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Full text available as PDF file on IPA web site (<http://www.geodata.soton.ac.uk/ipa/>).

This issue of *Frozen Ground* was compiled by Jerry Brown. Hanne Christiansen and Stephen Bowen (U.S.A.) provided editorial assistance. Donna Valliere prepared the camera copy.

EXECUTIVE COMMITTEE REPORT	2
REPORT OF THE EIGHTH ICOP	3
FIELD TRIPS	5
THE TROY L. PÉWÉ AWARD	8
REPORTS OF THE 14TH AND 15TH IPA COUNCIL MEETINGS	8
EXECUTIVE COMMITTEE MINUTES	15
WORKING GROUPS AND STANDING COMMITTEES 2003–2008	17
IPA COUNCIL RESOLUTIONS	21
NEWS FROM MEMBERS	22
OTHER NEWS	39
PUBLICATIONS	42
PLANNING CALENDAR	44
MEMBERS/NATIONAL CONTACTS/WORKING GROUPS	46

# EXECUTIVE COMMITTEE REPORT

This year was dominated by final preparations for, and participation in, the 8<sup>th</sup> International Conference on Permafrost in Zurich, Switzerland, July 21–25, 2003. The IPA Council, the Executive Committee and Working Parties met during the Conference. The following pages of *Frozen Ground* contain reports of these activities.

Approximately 300 representatives from 24 countries participated in the Conference. A total of 230 papers were published in a two-volume set, and an additional 97 extended abstracts were available for poster presentations. The final sessions of the conference included summaries by a group of rapporteurs. Pre- and post-Conference field trips took place in the Alps and in Svalbard. Reports of working parties were published in the 142-page extended abstract and programme volume. The organising committees, editorial staff, and local workers are congratulated for organising this highly successful and informative conference. The new International Advisory Committee provided constructive advice to the organisers. Available at the conference was the new CD version of CAPS 2.0: Circumpolar Active-Layer Permafrost System produced by and available from the U.S. National Snow and Ice Data Center (see p. 42).

The Council approved activities for 10 working groups; five working groups were renewed for a second, five-year terms, and the others are based on previous work of task forces and new initiatives for the Antarctic and astrobiology. The new, joint working group on glacier and permafrost hazards in high mountains is organised with the International Commission on Snow and Ice (ICSI). Other working groups are already jointly sponsored with the International Geographical Union (Periglacial) and the International Union of Soil Science (Cryosol). The new Antarctic WG is proposed as a joint activity with the Scientific Committee for Antarctic Research (SCAR). Individuals are urged to participate in the activities of the working groups (contact the co-chairs and see p. 17 for more details).

The Council approved membership of Iceland as its 24<sup>th</sup> member, and elected the new Executive Committee for the period 2003–2008 (see memberships on inside front cover). Two resolutions were approved related to planning and coordination of international activities, and permafrost responses to climate changes (p. 21). The Council approved the invitation from the University of Alaska to convene the 9<sup>th</sup> International Conference on Permafrost in Fairbanks, Alaska, in early summer 2008.

Interim permafrost meetings are planned for Tyumen, Russia, in May 2004 to celebrate the 60<sup>th</sup> anniversary of

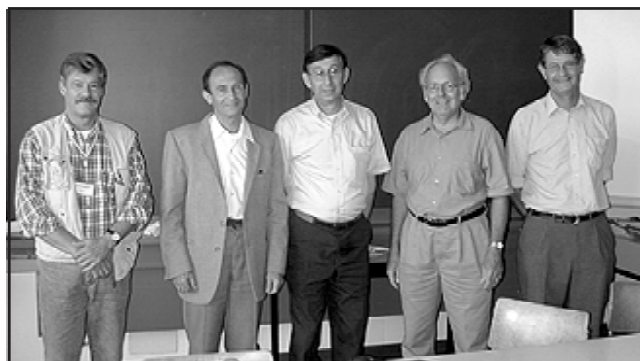
the Tyumen Region, the 2<sup>nd</sup> European Permafrost Conference, and a regional conference in China in 2006 and a field excursion to highlight the construction of the Qinghai-Tibet railroad.

Other cooperative projects include the Arctic Coastal Dynamics Project with the International Arctic Science Committee (ISAC) and GTN-P and CALM with the World Meteorological Organisation, and a proposed initiative for the International Polar Year (IPY).

A three-person fact-finding task force was approved by the Council to conduct a survey of the current constitutional issues and concerns raised by Members, and to make inquiries as to how other national and international organisations deal with questions of voting, membership fees, rotation of officers, and other organisational questions. Members are Brian Moorman (Chair, Canada), Eduard Koster (The Netherlands), and H.J. Walker (U.S.A.). The results of the survey will be considered as part of a long-term Strategic Plan.

The next five years will be very busy times for the IPA and its memberships, both for national representatives and individuals. The number of professional conferences and other activities continue to increase. We will rely on members of the Working Parties to represent the IPA, to participate in appropriate meetings, and to help plan ahead for the 2008 permafrost conference. The Executive Committee will be looking ahead to develop mechanisms to make IPA an even more effective international organisation.

Finally, the new Executive Committee, on behalf of the IPA, extends its appreciation to those past members for their exceptional service over the years: President Hugh French, Vice Presidents Wilfried Haerberli and Felix Are, and Member Truls Mølmann.



*Present officers of the IPA at Zurich. L-R: Hans-W. Hubberten, Georgy Perlishstein, Jerry Brown, Don Hayley, and Charles Harris. Not present, Zhu Yuanlin. (Photograph by Hanne Christiansen.)*

# REPORT OF THE EIGHTH INTERNATIONAL CONFERENCE ON PERMAFROST

From July 20–25, in the middle of an abnormally hot summer in central Europe, 296 frozen ground scientists and engineers from 24 countries came together at the Irchel campus of Zurich University for the 8<sup>th</sup> International Conference on Permafrost. During the week before, a rockfall event from the permafrost zone of the Matterhorn had necessitated a spectacular mountain rescue of climbers, providing remarkable advertising to the conference and increasing interest from the public and the media. A spectacular field trip in the Engadin preceded the conference (see field trip reports) from which sunburnt participants reemerged at the icebreaker reception on Sunday evening at the University of Zurich-Irchel. The opening ceremony on Monday morning started with a video sequence featuring a virtual flight across the Alps from Zurich to the frozen mountains around the Matterhorn. Welcoming addresses were given by Hans Weder, Director of the University, Kathy Riklin, member of the Swiss Parliament, Sarah Springman, Co-chair of the Organising Committee and Hugh French, IPA President. The names of recently deceased permafrost and periglacial specialists were read aloud by two senior participants (Jess Walker, U.S.A., and Felix Are, Russia; see insert (p. 5)).

The conference then commenced, with a very busy programme of plenary sessions, oral presentations and poster sessions. Much effort had been made to combine science and engineering, to promote contributions from younger researchers as well as the more established, and to ensure that all geographical regions were able to report orally on their work.

Plenary talks were chaired by Eduard Koster and Jess Walker, and provided overviews on *permafrost in arctic lowlands* (Christopher Burn and Karen Henry), *permafrost*

*in mountains and on slopes* (Charles Harris and Rupert Tart), *Ice Age permafrost* (Jef Vandenberghe and Georg Delisle), *subsea permafrost and arctic coasts* (Hans-W. Hubberten and Truls Mølmann), *permafrost in the Southern Hemisphere* (Jan Boelhouwers) and *planetary permafrost and astrobiology* (David Gilichinsky). Seven oral sessions were scheduled in three parallel meetings, with a wide range of subjects:

- *Permafrost Exploration*, Andreas Käab, Bernd Etzel-müller, session chairs.
- *Permafrost Interactions*, Ming-ko Woo, Antoni Lewkovicz, Marina Leibman, Christopher Burn, Martin Hoelzle, session chairs
- *Ice Age and Holocene Permafrost*, Max Maisch, session chair
- *Southern Hemisphere Permafrost*, Kevin Hall, session chair
- *Permafrost Material Properties*, Branko Ladanyi, session chair
- *General Infrastructure and Mining in Frozen Ground*, Kaare Flaate, session chair
- *Linear Structures in Frozen Ground*, Rupert Tart, session chair
- *Foundations in Frozen Ground*, Jack Clark, session chair
- *Modelling of Permafrost Phenomena*, Michael Davies, session chair
- *Permafrost Slopes and Hazards*, Johan Ludvig Sollid, Wilfried Haeberli, Don Hayley, session chairs
- *Coastal and Subsea Permafrost*, Volker Rachold, Hans-W. Hubberten, session chairs
- *Recent Warming*, Larry Hinzman, session chair
- *Climate-Related Monitoring*, Thomas Osterkamp, session chair

Each oral session contained five talks, leaving some time for final discussion. Oral sessions were complemented by five poster sessions. Related posters were presented during two consecutive days, enabling authors to visit other posters from the same poster slot. Posters describing current research were presented on one day.

Principal results and conclusions of the presentations were summarized in short plenary reviews (sessions chaired by Sarah Springman and Charles Harris) on Friday morning. In order to give the younger conference participants an opportunity to contribute in a plenary session, these reviews were written by a 'junior' rapporteur, with help from a senior colleague (senior rapporteur), and were presented by them as follows:

- Christian Hauck: Remote sensing, geophysics, drilling (Steven Arcone)
- Martin Hoelzle: Spatial models, geoinformatics (Tingjun Zhang)



*Wilfried Haeberli opens the conference. (Photograph by Max Maisch.)*

- Marcia Phillips: Interactions with air, snow, ice, water (Douglas Kane)
- Steve Kokelj: Interactions with vegetation, soils, ecology (Antoni Lewkowicz)
- Anne-Marie LeBlanc: Characterization and material properties (Ted Vinson)
- Arne Instanes: Infrastructure—general and mining (Kåre Senneset)
- Douglas Goering: Infrastructure—linear structures
- Hannele Zubeck: Infrastructure—foundations (Michel Dysli)
- Lukas Arenson: Slopes and hazards (Norikazu Matsuoka)
- Tetsuo Sueyoshi: Modelling (Sarah Springman)
- Daniel Vonder Mühl: Recent warming (Vladimir Romanovsky)
- Ketil Isaksen: Climate-related monitoring (Sharon Smith).

Another new initiative took advantage of the presence of permafrost experts, who shared their ideas in a public forum at ETH Zurich on Tuesday evening. Oleg Anisimov and Frederick Nelson discussed the *challenges of climate change*, Wilfried Haerberli and Sarah Springman presented a review of *icy mountain slopes* and François Costard's theme was *permafrost in space*. The lecture theatre was well filled with a range of members of the public, some with scientific backgrounds, and conference participants.

Both the IPA Council and Executive Committees each met twice during the week (see following reports). Meetings of Working Parties were organised throughout the week as follows: Antarctic Permafrost (Jan Boelhouwers); Periglacial Processes and Environments (Jeff Vandenberghe); Permafrost Engineering (Branko Ladanyi); Cryosols (Charles Tarnocai); Mapping and Modelling of Mountain Permafrost (Bernd Etzelmüller); Coastal And Offshore Permafrost (Hans-W. Hubberten); Data and Information (Roger Barry); Isotopes (Hans-W. Hubberten); ESF PACE21 Network (Charles Harris) and Climate Change (Frederick Nelson).

The barbeque on Wednesday on the terrace at the University, with accompanying Swiss musicians, followed the afternoon excursion "Zurich by Ice" to the nearby Üetliberg mountain, which overlooks the town. Various tours were offered to highlight the importance of the glaciations in

relation to the topography, geomorphology and engineering properties of soils and rocks in and around the Zurich town and lake. Wilfried Haerberli played the Pied Piper by leading a large group of people on a walk down from the summit, past rainfall-induced landslides, through woods and to inspect water diversion and flood-erosion control measures.

A highlight for everyone was the well-attended banquet on Thursday. This was an informal dinner on board a boat that took participants to the upper parts of Lake Zurich and back. The programme for accompanying persons, led by Mengia Amberg, provided visits to special sites in Switzerland, such as the spectacular Rheinfalls and Munot Tower in Schaffhausen, the 3000 m+ Jungfrauoch, famous museums in Basel and also to the ancient city of Lucerne on the banks of the Vierwaldstättersee and under the shadow of Mount Pilatus.

The closing ceremony saw the first presentation by the retiring IPA president, Hugh French, of the inaugural "Troy L. Péwé Award" to the best young author, Lukas Arenson (see p. 8). This was followed by a highly entertaining Power Point presentation of conference pictures by Sarah Springman. Professor Wilfried Haerberli then orchestrated a roll call of the entire crew responsible for the local organisation. An invitation was delivered by the U.S. delegation, led by Douglas Kane, to the 9<sup>th</sup> International Conference on Permafrost, to be held in 2008 at the University of Alaska in Fairbanks. Finally, the conference was closed by the incoming IPA President, Jerry Brown.

Conference publications include the two Proceedings volumes (edited by Marcia Phillips, Sarah Springman and Lukas Arenson; see p. 42 for ordering information), a special volume containing extended abstracts reporting current research and new information (edited by Wilfried Haerberli and Dagmar Brandova), a guide to the mid-week excursion "Zurich by Ice" as well as to the field trips Engadin, Svalbard and central Alps. The proceedings contain a total of 230 papers with the highest number of contributions from non-Russian European countries (71), followed by Russia (64), the U.S.A. (40), Canada (30), Japan (12), China (10), and Kazakhstan, Mongolia and New Zealand (1 each). The total number of extended abstracts was 97 with 43 contributions from non-Russian European countries, 30 from



*Closing ceremony. (Photograph by Max Maisch.)*

The following distinguished colleagues have died since the 1998 conference.

**Argentina**

Arturo Corte–2001

**Canada**

Hank Johnston–1999

**China**

Qiu Guoqing–1999

**Poland**

Anna Dylkowa–2000

Alfred Jahn–1999

**Russia**

Alexei Alexandrovich Arkhangelov–2002

Igor Dmitrievitch Danilov–1999

Grigoriy Ignatievich Dubikov–2001

Andrian Ivanovich Efimov–2000

Nikolai Alexandrovich Grave–2002

Alexandr Alexandrovich Kolesov–1999

Alexandr Glebovich Kostyaev–1998

Nadezhda Petrovna Levantovskaya–2002

Fedor Nikolaevich Leshchikov–2002

Petr Nikolaevitch Lugovoy–1999

Gavriil Osipovich Lukin–1998

Irina Valerianovna Protasieva–2000

Petr Alexeevich Soloviev–2002

Veniamin Alexandrovich Sovershaev

Valentin Ionovich Spesivtsev

Nina Alexandrovna Velmina–1999

Konstantin Sergeevich Voskresensky–2000

Lev Andreevich Zhigarev–1999

Vladimir Fedorovich Zhukov–1999

**Sweden**

Anders Rapp–1998

**United States**

Duwayne Anderson–2002

Fred Crory–2002

Ralph Fadum–2000

David Hopkins–2001

Troy Péwé–1999

Louis Quam–2001

Russia, 9 from the U.S.A., 5 from Canada, 4 from Japan, 2 from Argentina and 1 from China, Kazakhstan, Mongolia and New Zealand.

Funding by a number of Swiss sponsors (the main funding sponsors were the Swiss Agency for Development and Cooperation and the Swiss Academy of Sciences) made it possible to cover registration fees completely for 43 participants from soft-currency countries and at 50% for 31 student/doctoral/postdoctoral researchers from western countries, and a special hosting programme entitled “young scientists help young scientists” saved costs for those who were under 30 years old and willing to stay with Swiss students. The net cost of this programme was SFr 50,000, and was funded entirely by sponsorship.

The University of Zurich, the Swiss Federal Institute of Technology in Zurich and the Swiss Federal Institute for Snow and Avalanche Research in Davos were the local hosts, and are responsible for carrying the small loss made. They were supported fully by their European colleagues, originally

from the EU PACE and now the PACE21 programme (supported by the European Science Foundation). Both of the PACE programmes were instigated and are managed under the leadership of Charles Harris, who also acted as Co-Chair to the Conference. The University of Zurich particularly, under the coordination of Wilfried Haerberli, is to be thanked for its stewardship and hospitality. The university provided an excellent array of rooms and lecture halls, as well as plenty of space for posters, working group meetings, and of course the necessary supply of liquid and solid nourishment.

The Local Organising Committee from the 8th ICOP in Zurich looks forward to meeting everyone again in Alaska in five years’ time, and wishes the new Organising Committees all the best for their mammoth task!

Wilfried Haerberli, IPA Vice President,  
Sarah Springman, Co-Chair, Swiss Organising Committee,  
and Charles Harris, Co-chair, European Union  
Organising Committee

## FIELD TRIPS

### *Excursion A3: Mountain Permafrost, Upper Engadin, Switzerland*

*18 July–20 July 2003*

- July 18: Zurich–Celerina–Trais Fluors  
(Norikatzu Matsuoka)–Samedan–Muottas Muragl  
July 19: Muottas Muragl – Alp Languard – Pontresina  
July 20: Group A–Corvatsch–Murtèl – Zurich  
Group B–Flüelapass – Davos–Zurich

The St. Moritz Region/Upper Engadin is one of the best investigated permafrost research area of the Alps. Several

scientific projects, including engineering investigations (foundations of cable cars, avalanche protection work) have been undertaken over the last some 20 years. Questions related to natural risks bring scientists and engineers together to find integrated pragmatic solutions.

Topics discussed during the excursion included: natural hazards, climate and permafrost, permafrost distribution, high mountain construction work on permafrost, processes in creeping permafrost and geomorphology, frost heave and solifluction, rock glacier dynamics, weathering and bedrock stability, stability of frozen debris, and interrelation



*Participants in the A3 field trip. (Photograph courtesy of James (Drew) Hyatt.)*

between permafrost and glaciers. A 53-page field guide was edited by F. Keller and was available to the participants. The guide contains sections by authors from institutions in Switzerland, Germany, and Japan.

The excellent weather conditions during the field trip allowed the participants to enjoy the spectacular landscape and the interesting scientific sites of the Upper Engadin. The stay at the Muottas Muragl Hotel will remain unforgettable for the participants as well as for the excursion leaders.

**Leaders:**

Lukas Arenson, Susanne Hanson, Martin Hoelzle, Atsi Ikeda, Felix Keller, Christof Kneisel, Norikazu Matsuoka, Martina Lütschg, Marcia Phillips, Armin Rist, Christine Rothenbühler, Sarah Springman.

**Participants:**

Twenty-five participants from 13 countries took part in the pre-conference excursion to the Upper Engadin, Switzerland: Richard Ladstadter (Austria); Irene Heyse (Belgium); Margo Burgess, Richard Fortier, Brian Moorman, Sharon Smith (Canada); Mette Oht (Denmark); Kimmo Lehto, Timo Ruskeenieni, Kirsti Loukola & Ruskeenieni (Finland); Georg Delisle (Germany); Megan Balks (New Zealand); Stefan Bartoszewski, Kazimierz Pękala, and Janina Repelewska-Pękala (Poland); Gonçalo Vieira (Portugal); Peter Permyakov (Russia); Achim Beylich (Sweden); Marc Luetscher (Switzerland); and James Bockheim, James Hyatt, Charles Slaughter, Jason Smith, Rupert Tart (U.S.A.).

**Itinerary:**

**18 July:** Travel from Zurich by car to Celerina, Upper Engadin and by cable car and chairlift to Trais Fluors. Visits to view several different periglacial phenomena, such as patterned ground, rock glacier, solifluction. This day was led by N. Matsuoka and A. Ikeda.

**19 July:** Trip to the Val Muragl rock glaciers and Pontresina-Schafberg to discuss and observe the following: glacier history, permafrost distribution, geophysical investigations on rock glaciers and glacier forefields, interaction between glacier and permafrost, photogrammetry on rock glaciers, drilling in rock glaciers, geotechnical investigation in rock glaciers, borehole monitoring, avalanche protection

work in permafrost slopes, constructions against natural hazards. This day was led by L. Arenson, C. Kneisel, S. Springman and M. Phillips.

**20 July:** Group A: Visit to the Murtèl-Corvatsch area to discuss and observe the following: high mountain construction on the summit of Corvatsch, low altitude ice archives and thermal structure of the Muragl glacier, active layer investigations in Murtèl area, investigations on rock glacier Murtèl (geophysics, geotechnics, microclimatology, photogrammetry, drilling). This group was led by M. Hoelzle, L. Arenson, F. Keller, and S. Hanson.

**20 July:** Group B: Visit of Bever Valley with low altitude permafrost investigations, visit to Flüelapass with permafrost in a scree slope and visit to the Swiss Federal Institute for Snow and Avalanche Research in Davos. This group was led by C. Kneisel, M. Lütschg and M. Phillips.

Groups A and B joined together at Davos and travelled by car back to Zurich.

Martin Hoelzle (Hoelzle@geo.unizh.ch)

**Field Excursion B1: Permafrost, glaciers and natural hazards in the Central Alps, 26 July – 2 August 2003**

The focus of the excursion was on the scientific and applied aspects of high mountain permafrost and glaciers in the Central Alps. Thirteen participants from eight countries took part. A compilation of reports and reprints were available to the participants.

**Leaders:** Andreas Käab and Wilfried Haerberli.

**Participants:** LeeAnn Fishback (Canada), Holger Wetzel (Germany); Roberto Seppi (Italy), Mamoru Ishikawa (Japan), Marina Tishkova (Russia), Reynald Delaloye, Christophe Lambiel, Emmanuel Reynard (Switzerland), Margaret Allen (U.K.), Oscar Ferrians, Charles Slaughter, Tingjun Zhang (U.S.A.).

**Itinerary:**

**26 and 27 July:** On the 3450-m-high Jungfrauoch discussed construction works in high mountain permafrost



*Group photograph of B1 participants at sunset. (Photograph courtesy of Emmanuel Reynard.)*



and permafrost processes in rock walls. Geophysical monitoring and modelling studies of mountain permafrost presented for the 2970-m high Schilthorn.

**28 July:** After travel to the Italian Alps, visited a presently active surge-type glacier, and the 2500-m high Monte Rosa east face. A number of severe hazards are related to the glacier surge and potential permafrost degradation in the east face.

**29 July:** In the nearby Saas valley, the focus was on rock glaciers, and rock glacier–glacier interactions. At the Gruben area, a number of dangerous lakes developed in such periglacial environment.

**30 July:** In the nearby Matter valley visited the 2950-m high Seetalhorn (above Graechen) where frequent and dangerous debris flows due to permafrost degradation originate. In the afternoon, viewed the Randa rock fall (1991) and the village of Taesch where a debris flow occurred in 2001.

**31 July:** Visit to Gornergrat and Stockhorn, the location of the highest PACE permafrost borehole at 3410 m asl. Focus was on permafrost distribution and rock glaciers below Gornergrat.

**1 August:** At and around Mt. Gele in the Lower Valais observed a talus slope with discontinuous permafrost, the frozen moraine of the Ortin glacier, and constructions on permafrost.

**2 August:** From the Alps and to the Swiss Jura mountains to visit a site of low-elevation marginal permafrost (1200 m asl).

Andreas Kääb (kaeab@geo.unizh.ch)

### **Field Excursion B2: Permafrost, periglacial features and glaciers, Svalbard, 26 July–3 August 2003**

Ten participants from eight countries took part in the post-conference excursion to the high Arctic in Svalbard. Permafrost conditions, periglacial landforms and glaciers were observed in this continuous permafrost region. The excursion was based partly on the 1988 pre- and post-conference field excursions to Svalbard that were held in connection with the Fifth International Conference on Permafrost. In addition, new permafrost research and investigations and institutions established in Svalbard since 1988 were discussed and visited.

A 143-page guidebook edited by J.L. Sollid and H.H. Christiansen was available to the participants. The guide contains 17 separate text sections by 12 authors from six different Norwegian institutions who are conducting permafrost research and/or teaching.

Highlights were the visits to the spectacular sorted stone circles at Kvadehuksletta on Brøggerhalvøya close to Ny-Ålesund (front cover of *Science*, January 2003), and the visit to the Svea coal-mine partly drowned in meltwater below the Høgenesbreen glacier. In the Longyearbyen area we visited a variety of periglacial landforms and glaciers, and enjoyed the facilities of this modern high-arctic village.

**Leaders:** Hanne H. Christiansen, Rune S. Ødegård, Ole Humlum, Arne Instanes, and Truls Møllmann.

**Main organiser:** Johan Ludvig Sollid

**Participants:** Victor Kaufmann (Austria), Irene Heyse (Belgium), Anne-Marie LeBlanc and Kumari Karunaratne (Canada), Takehiko Kobayashi (Japan), Christine Elliot (New Zealand), Marc Luetscher and Nadine Salzmann (Switzerland), Colin Whiteman (U.K.), and Sarah Kopczynski (U.S.A.).

#### **Itinerary:**

**26 July:** arrive at Longyearbyen airport, Svalbard.

**27 July:** Flight to Ny-Ålesund. Visit to Brøgger rock glacier and to the glaciers Austre Brøggerbreen and midre Lovénbreen.

**28 July:** Boat to Kvadehuksletta, visit to sorted stone circles, raised beaches and the Stuphallet rock glacier. Walked back to Ny-Ålesund over the glacier Mørebreen.

**29 July:** Visits to the stations of the Norwegian Polar Institute and the Alfred Wegener Institute in Ny-Ålesund. Flight to Longyearbyen.

**30 July:** Visit to the University Centre in Svalbard (UNIS) in Longyearbyen. Boat to Hjortfjellet and visit to the Hiorthfjellet rock glacier.

**31 July:** Flight to Svea where personnel of the Norwegian coal mine company, Store Norske Spitsbergen Grubekompani A/S, explained the mining activities and arranged a visit to the active mine located below the glacier.

**1 August:** Walking excursion to the glaciers Longyearbyen and Larsbreen.

**2 August:** Bus excursion to Adventdalen to visit low-centered ice wedge polygons, the UNISCALM site and mine seven (7). Visits to the Longyearbyen airport site and the road to Plateau mountain. The day ended with oral presentations about the Høgenesbreen glacier road to Svea, and on the engineering and infrastructures in Longyearbyen.

**3 August:** Car excursion to the Longyear valley to visit avalanche, debris flow and rock weathering sites. Afternoon departure.

Hanne H. Christensen (hanne@unis.no)  
Rune S. Ødegård (rune.oedegaard@hig.no)



*Field excursion B2 participants with Technical Director H. Higrav and Engineer O. Fjesme from the Norwegian mine company, Store Norske Spitsbergen Grubekompani A/S. (Photograph by Hanne H. Christiansen.)*

## THE TROY L. PÉWÉ AWARD

Dr. Lukas Arenson is the first recipient of the Troy L. Péwé Award, the first honour that the Association has created. The award was made at the closing ceremonies of the 8<sup>th</sup> International Conference on Permafrost.

Professor Troy L. Péwé, the founding Vice-President (1983–1988) and second President (1998–1993) of the Association, died in 1999. Following discussions between Mary-Jean Péwé, and IPA President Hugh French, the Executive Committee and Council unanimously approved the establishment of this award at Zurich. It was agreed that the award would be given to the author of the most outstanding research paper published in either permafrost science or permafrost engineering at each International Conference on Permafrost. Eligible candidates must 1) be in the early stages of their career, usually less than 35–40 years of age, 2) be the senior or single author of the paper, and 3) have the paper accepted not only in the Proceedings volume, but also for oral presentation at the conference. The award consists of a plaque and a cash amount.

In order to make the first award at Zurich, an ad hoc committee was established consisting of IPA President Hugh French and Professors Eduard Koster (The Netherlands) and Ted Vinson (United States). The paper written by Dr. Arenson was co-authored with Professor Sarah Springman and Philip Hawkins. It presented new data concerning the movement of an ice-rich rock material and had the title “Pressuremeter tests within an active rock glacier in the Swiss Alps.” Dr. Arenson was also the senior author of a second paper and a co-author on two additional papers published in the Proceedings volume. Collectively, these papers were judged to be an outstanding contribution to permafrost engineering. Much of the research was based upon his Ph.D., obtained in 2002



*Lukas Arenson received the First Troy L. Péwé Award from outgoing IPA President Hugh French, July 25, 2003. (Photograph by Max Maisch.)*

from the Institute for Geotechnical Engineering, ETH-Zurich, and under the supervision of Professor Sarah Springman. The thesis dealt with unstable alpine permafrost and variations in geotechnical behaviour with time and temperature. Lukas is also a marathon athlete and a member of his local drumming band in Basle. Currently, he is working at the University of Alberta, Edmonton, Canada, with Professor Dave Segó.

In preparation for the second award at the 9<sup>th</sup> International Conference in 2008, the IPA Executive Committee will establish a more formal competition that will be announced when the official call for papers is circulated.

Hugh French

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## REPORTS OF THE FOURTEENTH AND FIFTEENTH IPA COUNCIL MEETINGS AND EXECUTIVE COMMITTEE

### FOURTEENTH COUNCIL MEETING, JULY 21, 2003

The meeting convened at 3:20 p.m. and adjourned at 5:15 p.m.

The following attended both meetings except as noted by asterisks: (Fourteenth\* and Fifteenth\*\* Council Meetings)

COUNCIL MEMBER REPRESENTATIVES AND  
EXECUTIVE COMMITTEE

Argentina: Dario Trombotto

Austria: Gerhard K. Lieb\*, Andreas Kellerer-Pirklbauer\*\*

Belgium: Irene Heyse

Canada: Margo Burgess, Hugh French, Don Hayley,  
Brian Moorman

China: Ma Wei, Zhu Yuanlin (EC), Lai Yuanming\*\*

Denmark: Niels Foged

Finland: Matti Seppälä

France: François Costard\*

Germany: Lorenz King, Hans-W. Hubberten

Iceland: Hlynur Oskarsson\*

Italy: Francesco Dramis,\* Mauro Guglielmin\*\*

Japan: Norikazu Matsuoka,\* Mamoru Ishikawa\*\*

Kazakhstan: Sergei Marchenko

Mongolia: Natsagdori Sharkhuu

Netherlands: Jef Vandenberghe\*

Norway, Kaare Flaate, Truls Mølmann  
Hanne Christiansen (Secretariat)  
Poland: Kazimierz Pełkala  
Russia: Felix Are, Georgy Perlshtein  
Nikolai Romanovskii\*\*  
Southern Africa: Jan Boelhouwers (proxy)  
Spain: Gonçalo T. Vieira (proxy)  
Switzerland: Daniel Vonder Mühl, Wilfried Haerberli  
U.K.: Charles Harris, Michael Davies\*\*  
U.S.A.: Jerry Brown, Larry Hinzman, Rupert Tart

Adhering Bodies not represented: Sweden at both council meetings; Iceland and The Netherlands not present at the Fifteenth

CO-CHAIRS AND MEMBERS OF COMMITTEES,  
WORKING GROUPS, TASK FORCES AND OBSERVERS  
present at the Fifteenth Council Meeting

Canada: Branko Ladanyi, Antoni G. Lewkowicz,

Dave Seago, Steve Solomon, Charles Tarnocai

Germany: Gabriel Broll, Volker Rachold

Italy: Nicoletta Cannone

New Zealand: Megan Balks

Norway: Ole Humlum, Arne Instanes

Russia: Oleg Anisimov, Felix Are, David Gilichinsky

Switzerland: Martin Hoelzle, Andreas Käb

U.S.A.: Roger Barry, Frederick Nelson, Ted Vinson

OBSERVERS

Norway: Chad Dick, Angélique Prick

Poland: Janina Repelewska-Pełkala

Switzerland: Vladimir Ryabinin, Tetsuo Sueyoshi

U.S.A.: Doug Kane

## 1. WELCOME

President Hugh French opened the meeting and welcomed the Council members and members of the Executive Committee.

## 2. ATTENDANCE AND ROLL-CALL

An official roll call verified that twenty Members were present with Gonçalo T. Vieira of Portugal representing Spain and Jan Boelhouwers representing Southern Africa, for a total of 22 voting Members.

The Agenda as presented by Secretariat Christiansen was reviewed and approved unanimously (moved by Harris and seconded by Moorman).

## 3. PREVIOUS COUNCIL MINUTES

The minutes of the Twelfth and Thirteenth Council meetings, Yellowknife, Canada, June 23 and 26, 1998, respectively, were reviewed and unanimously approved (moved by Tart and seconded by Moorman).

## 4. EXECUTIVE COMMITTEE MINUTES

The minutes of Executive Committee meetings since the Yellowknife meetings (1999, Copenhagen, Denmark; 2001, Rome, Italy; and 2002, Arundel, U.K.), and matters arising from them were reviewed. Summaries of major points of interest had appeared in prior issues of *Frozen Ground*. No vote was required.

## 5. SECRETARIAT'S REPORT

Hanne Christiansen reported that the Secretariat moved to the University Centre in Svalbard (UNIS) in Longyearbyen, in early 2002. Christiansen plans to step down as Secretary later in the year, but since she will remain at UNIS as a faculty member, she is willing to help in a transition phase. The Director of UNIS is agreeable to continue hosting the Secretariat, but salary is required for the Secretariat.

Christiansen provided detailed accounting of income and expenditures for the period 1999 to present. Annual contributions remain the major source of income. Norwegian sources provided an additional \$4400, and a small amount of revenue was recovered from advertisements in *Frozen Ground*. This year's budget is incomplete as contributions from a number of Members have not been received, but are forthcoming. The last issue of *Frozen Ground* exceeded previous costs because of its exceptional size (66 pages) and related increases in production and mailing costs. The actual camera copy was prepared in Longyearbyen, Svalbard, and printed and distributed in Copenhagen. French extended thanks to members of the Nordic countries for hosting the Secretariat since 1999, and to Hanne Christiansen and Jerry Brown for their hard work in producing *Frozen Ground*.

The 2003–2008 budget was provided as information for further discussion. It was noted by Harris that the annual contributions have remained relatively unchanged for some time (1997). Some Members might voluntarily increase their number of units (one unit = \$250.00) if requested. Foged agreed. Heise asked what would be the benefit to Members if they increased their number of units. French indicated that a future review of the Constitution might consider voting by number of units. However, he stressed that such a change would require a 2/3 vote and that this had not been decided upon. Seppälä noted that more official status in ICSU would make payment easier, and inquired if surplus revenue from prior conferences is provided to IPA.

Brown noted that IPA, as an affiliate of IUGS, is associated with ICSU but not at a high organizational level. Hayley indicated that the small surplus from the Yellowknife conference went to the Canadian National Committee for IPA, and that, in the future, any surpluses might be shared with the IPA. French indicated this was a topic for the new Executive Committee. Haerberli reported that the costs of hosting the 8<sup>th</sup> ICOP were in the order of 500,000 CHF and that the University has to be paid for use of facilities from any surplus. Trombotto suggested that future conferences might be organized in countries where expenses may be lower. Additional views were expressed about future funding, including having corporate and individual sponsors and members. Mølmann concluded that the annual Members' contributions alone are not enough to operate IPA, and that a strategy approach needs to be developed.

## 6. APPROVAL OF NEW MEMBER

A formal request for membership in IPA was received from Olafur Arnalds, Agricultural Research Institute, Iceland, in August 2001. The motion to accept Iceland's request for membership was made by Seppälä and seconded by Trombotto. The vote was unanimous. A one-unit annual membership fee was suggested. Hlynur Oskarsson, representing Olafur Arnalds, was pleased that Iceland was accepted into the Association.

## 7. INVITATION TO NINTH CONFERENCE

French explained that there had been two letters of invitation for the 2008 conference from both China and the United States. Because the conference in Alaska would mark the 25<sup>th</sup> anniversary of the founding of the IPA in Fairbanks (1983), China withdrew its invitation. Instead, it proposed an interim regional and field conference in 2006 to the Qinghai-Tibet Plateau to observe construction of the new railroad (see China report, p. 24). Douglas Kane, University of Alaska–Fairbanks (UAF) presented an official invitation from the Chancellor of UAF to host the conference in early summer 2008. Inexpensive housing will be available in student dormitories and all efforts will be made to keep cost as low as possible. The Council unanimously accepted the invitation with thanks to both Kane and Larry Hinzman, current President of the U.S. Permafrost Association.

## 8. REPORT OF THE NOMINATION COMMITTEE

The report of the Nomination Committee was submitted by Sollid (Chair), Tart and Are in June 2002 (see *Frozen Ground* 26, p. 7), and circulated to Council Members by French on December 15, 2002. Statements by each candidate were included. A ballot to change the Constitution was also submitted to Members to change the responsibilities of the Vice Presidents concerning ICOP. That mail ballot received the required 2/3 vote and the change is published in the Constitution dated 1 March 2003. As a result, it is no longer necessary for either of the Vice Presidents to be from the country hosting the next conference.

The slate of nominations for the new Executive Committee for 2003–2008 was:

President: Jerry Brown and Wilfried Haerberli

Vice Presidents (2): Charles Harris, Georgy Perlshtein, and Zhu Yuanlin

Ordinary Member (3): Don Hayley, Hans-W. Hubberten, Douglas Kane, Truls Mølmann, and Dario Trombotto (Springman had earlier requested withdrawal of her name).

## 9. PROCEDURE FOR ELECTION

French explained that the election of the members of

the Executive Committee would be sequential, with one position at a time, in the order President, Vice President, and Ordinary Members. Candidates not elected for one position were eligible for the subsequent position if they so chose. As required by the Constitution, the election was by secret ballot. Kevin Hall was selected scrutiner, assisted by Secretariat Christiansen. There were 23 eligible votes present including the newly-elected Iceland.

Prior to the start of the Council meeting Vice President Haerberli informed President French that he was withdrawing from the election. He requested an opportunity to address the Council to explain his reasoning. Haerberli then made a formal statement, in which he withdrew from the election. He voiced the opinion that the time had come for one of the smaller countries from the mountainous part of the world to assume leadership of the Association.

## 10. EXECUTIVE COMMITTEE ELECTION

Results of the election were:

President: As a result of Wilfried Haerberli's withdrawal, Jerry Brown was elected President by acclamation.

Vice-Presidents (2): Charles Harris was elected Vice-President on a first ballot and Georgy Perlshtein was elected Vice-President on a second ballot.

Ordinary Members (3): Kane and Mølmann had withdrawn prior to the election. Don Hayley, Hans-W. Hubberten and Zhu Yuanlin were elected.

Following Brown's election there was an informal exchange of views among Council and Executive Committee Members. The issues of rotation of the officers, competitive elections and a President from a European country were discussed.

Vonder Mühl stated that the present election procedure is unsatisfactory because, if more than one candidate is recommended by the Nominations Committee for the position of President, this creates an awkward situation for the non-elected candidate. He suggested that clearer rules for the election of officers be elaborated and that, if necessary, changes be made to the IPA constitution. He also thought that it is time for the IPA presidency to be held by an individual from a country other than Canada, China, Russia, or the U.S.A.

Understandably, disappointment was expressed that the present situation had arisen.

## 11. ADJOURNMENT

Following the election the Council was adjourned. The remaining items, 11 and 12, concerning relations with ICSI, IUGS and SCAR, and constitutional changes, were deferred to the July 25 Council meeting. Tart made the motion to adjourn and Moormam seconded; approved unanimously.

## FIFTEENTH COUNCIL MEETING, 25 JULY 2003

The Council meeting convened at 1:30 p.m. and temporarily adjourned between 3:35 and 4:45 p.m. for the Council members and guests to attend the Closing Session of the 8<sup>th</sup> ICOP.

President Brown chaired the meeting. In his opening remarks Brown congratulated the organising committees for an exceptionally successful conference, thanked retiring members of the Executive Committee French, Are, Haerberli, and Mølmann for their dedicated services, thanked Flaate and members of the International Advisory Committee for their advice, welcomed the new members to the Executive Committee Harris, Hayley, Hubberten, and Perlshstein, and thanked International Secretariat Christiansen for her outstanding services and, particularly, for the production of recent issues of *Frozen Ground*. Brown indicated that one of the main purposes of this Council meeting was to review and approve working parties activities and to consider several resolutions for the 2003–2008 period.

### 1. APPROVAL OF MINUTES AND AGENDA

The minutes of the July 21 Council meeting were approved in principle in the absence of a written version. Minutes of both Council meetings will be circulated to all members.

Christiansen reviewed the agenda. Motion to accept by Hinzman, seconded by King, approved unanimously.

### 2. DRAFT BUDGET 2003-2008

Incorporated and discussed under Item 6.

### 3. REPORT ON THE 8<sup>TH</sup> ICOP

Following Item 6, Haerberli presented a short report on attendance, sponsorship, and other programmatic details which are found in the Conference report (pp. 3–5). A report from the editorial group covering the online submission and review, peer review, and publishing procedures was submitted to the Executive Committee for consideration

in the IAC report. Total budget was approximately 200,000 CHF, plus many voluntary contributions and staff time by the University of Zurich and ETH. Approximately 120 persons received partial support in the form of reduced registrations and local hosting, the majority being young people and participants from Eastern Europe. This support did not affect the registration fees. Council representative Moorman commented that this support to young people worked well and extended formal thanks. A detailed post-Conference report will be prepared by the organisers in addition to the article presented for *Frozen Ground*.

Item 10 concerning the International Council on Snow and Ice (ICSI) was presented by Haerberli prior to his leaving for preparations of the Closing Session. Haerberli is a permanent member of ICSI representing the WGMS. ICSI is a Commission of the IAHS which in turn belongs to the IUGG. Background on the ICSI–IPA discussions was reported in *Frozen Ground* 26 (pp. 56–57). In order to facilitate cooperation between our two organisations, a joint working group on glacier and permafrost hazards in the high mountains will be proposed. The IUGG will be undergoing restructuring over the next six years and the future of cryosphere disciplines will be under active discussion. IPA will be kept advised.

### 4. PLANS FOR THE 9<sup>TH</sup> ICOP

Kane and Hinzman reviewed plans for the conference to be held in Fairbanks in early summer 2008 to avoid competition with other international conferences in August and other summer field plans. The new Executive Committee recommended that membership of the new IAC await the Committee's report and the formation of the U.S. organising committees. Hinzman solicited and welcomes advice from the present IAC and from the prior Canadian experience. The Executive Committee will follow up on the IAC report and future membership.

### 5. PLANS FOR WORKING PARTIES

Followed Items 6 and 3. Essentially all working parties met during the Conference. Reports and recommendations



*The Fifteenth Council Meeting. (Photograph by Ole Humlum.)*

were presented by the co-chairs or their representatives. Council members moved for acceptance of each report after brief discussion. Pages 17–20 contain the results of the Council approvals and a list of liaison organisations and programs and acronyms. The following is the record of the discussions and voting:

- *Glacier and Permafrost Hazards in High Mountains:* Kääb summarised major points of a detailed planning document prepared jointly by ICSI and IPA. The precedent exists in IPA to have joint activities (IUSS for Cryosol and IGU for Periglacial). Motion to accept report by Vonder Mühll, King seconded, approved with one abstention.
- *Task Force on Rock Glacier Dynamics:* The main activities were completed. Motion to formally conclude the Task Force by Boelhouwers, Moorman seconded, approved unanimously.
- *Standing Committee on Data, Information and Communications:* Barry reported that Sharon Smith is nominated as the new Co-chair. Thanks were extended to former Co-chair Mike Clark for his long service, and to Barry and the staff of NSIDC for organising and producing the CAPS 2.0 CD ROM. Motion to accept report by Moorman, Hinzman seconded, approved unanimously.
- *Cryosol:* The WG has existed for 10 years as a joint working group with the IUSS; both having the same name. Council agreed that it is acceptable for the WG to continue its new activities without changing its name in order to conform with IUSS plans. Motion to accept report by Boelhouwers, Moorman seconded, approved unanimously.
- *Permafrost Engineering:* There are two new Co-chairs. Several subtasks will be developed to facilitate activities. Motion to accept report by Guglielmin, Mølmann seconded, approved unanimously.
- *Coastal and Offshore Permafrost:* The subgroup on Coastal Erosion and its Arctic Coastal Dynamics project is combined into the main working group. Motion to accept report by Hinzman, Seppälä seconded, approved unanimously.
- *Periglacial Processes and Environments:* The 10-year term of this joint working group with the IGU commission has expired. The scope of a new joint IPA/IGU activity is being negotiated, and a one-year extension was requested. Motion to extend the WG for one year by Seppälä, Vieira seconded, approved unanimously.
- *Isotopes and Geochemistry of Permafrost:* In response to a questionnaire and added interests there are sufficient reasons for the Task Force to become a working group with its new Co-chair and a Secretariat located at AWI, Potsdam. Motion to create a new working group by Mølmann, Hinzman seconded, approved unanimously.

- *Mapping and Modelling of Mountain Permafrost:* The activities of this Task Force warrant a new working group with two subgroups with specific mountain and regional mapping goals. Motion to create a new working group by Guglielmin, Vonder Mühll seconded, approved unanimously.
- *Permafrost and Climate:* The current working group has been in place for the 10-year term. A newly constituted WG focused on permafrost and climate interactions with several subgroups was proposed. Motion to reorganise the current WG by Vonder Mühll, Kellerer-Pirklbauer seconded, approved unanimously.
- *Antarctic Permafrost and Periglacial Environments:* This working group replaces the Southern Hemisphere WG and is being developed jointly with SCAR. Motion to accept report by Guglielmin, Seppälä seconded, approved unanimously.
- *Permafrost Astrobiology:* The basis of this new WG was described in the report by Gilichinsky in *Frozen Ground* 26 (pp. 52 and 53). Motion to create a new working group by Moorman, Guglielmin seconded, approved unanimously.

## 6. SECRETARIAT 2003-2008

The appointment of a new Secretariat is dependent on funding. Christiansen agrees to continue until the end of the calendar year. As indicated previously UNIS is agreeable to continue hosting the Secretariat, but salary is required for the Secretariat. The presence of IPA at UNIS offers many advantages for the international visibility of the IPA. The Executive Committee will work towards a solution of funding for a new Secretariat. In the interim Brown agreed to take responsibility for production of *Frozen Ground* 27. Reports from Members are due by mid-September.

The draft budget for the period 2004–2008 was reviewed. As noted by the EC the projected income for the balance of 2003 and 2004 is adequate to support an annual issue of *Frozen Ground*, one meeting of the EC, and limited hourly compensation, but not for the support of working party activities. New sources of funding are required to support a part-time Secretariat. Members are encouraged to explore private and government funding for operating the Secretariat, and can increase their individual contributions on a voluntary basis. Hayley noted this is a “bare bone” or minimal budget. Vonder Mühll inquired as to the source of the other \$5000. This assumes solicited contributions. The motion to accept moved by Moorman, seconded by Vonder Mühll, and approved unanimously.

## 7. CONSTITUTIONAL CHANGES

Following reconvening of the Council, Hayley introduced the question of recent and possible future changes in the Constitution to reflect the changing scope and com-

position of the IPA, as well as its financial support. He suggested this could be best undertaken in the context of a broader strategic planning exercise. It was resolved that over the next 1–2 years the EC prepare a draft Strategic Plan for Council consideration, and that questions related to the Constitution and By-laws be addressed in the Plan. In a letter to President French by the Canadian Member (February 18, 2003), several questions were raised concerning the mail ballot to change the Constitution (December 15, 2002). These involved the implementation of the Nomination Committee's report and subsequent voting privileges by Members based on the status and structure of annual fees. The lack of a clear succession of EC members was also raised.

The questions of the current fee structure were discussed. It was agreed that no formal changes be made until the Strategy Plan is prepared. However, Members can increase their contribution on a voluntary basis. It was noted that some Adhering Bodies are encountering difficulties in providing these annual commitments.

Following these lengthy and productive discussions, the Council agreed that a small, fact-finding task force be designated to conduct a survey 1) of the current constitutional and related issues/concerns, and 2) of how other national adhering organisations, and other similar ICSU organisations deal with these questions. The Task Force would have an advisory role and be guided by Terms of Reference given by the EC. Hayley and Brown will draft the Terms of Reference. Moorman agreed to chair a three-member task force, and other members would be identified by the EC. Results are needed before the next Nominating Committee begins work. Recommendations or guidelines from National academies and councils are important. The results of the survey will be considered as the EC, with advice from Council, develops the draft Strategic Plan. The joint motion to form the task force and to develop a Strategic Plan was moved by Burgess, seconded by Hinzman, and unanimously approved.

## 8. RESOLUTIONS

Brown introduced the need for formal resolutions and indicated that the Yellowknife resolutions on the GTN-P and Antarctic initiative provided the basis for their successful implementation (see *Frozen Ground* 22, p.16). Several draft resolutions were distributed for review prior to the Council meeting. They focused on international cooperation and coordination and the responses of permafrost to climate changes. Brown acknowledged Vladimir Ryabinin, WCRP, for his constructive review comments. Nelson as Co-chair of the Permafrost and Climate WG presented each resolution (see p. 21). Hubberten commented that the list of activities was comprehensive. Hinzman suggested that results be reported more frequently at annual meetings such as at the AGU, EGS, Pushchino etc. Motion to accept Resolution 1 by Moorman, seconded

by Hinzman, approved unanimously. Motion to accept Resolution 2 by Boelhouwers, seconded by King, approved unanimously.

## 9. INTERCONFERENCE PLANS 2003–2008

See Item 3 for discussion of ICSI. Items 9 and 10 were combined. Brown reported briefly on major activities, many of which are referred to in the Resolutions. These include planning and implementation activities for the IPY, ICARP, Antarctic, and participation in congresses during the forthcoming period (see *Planning Calendar*, p. 44). The EC plans to meet during the Tyumen conference in May 2004 and annually at other meetings. Council meetings could be convened if a majority of Members were present in conjunction with the China field conference (2006), the Geomorphology Conference in Spain (2005), or a proposed Second European Permafrost Conference. An entire, one-day meeting of the Council would be scheduled in Fairbanks prior to the start of the 9<sup>th</sup> ICOP.

The possibility of developing an email listserve to facilitate communications and coordination among members of IPA committees and working groups was discussed and will be explored with the assistance of the SCDIC.

## 10. OTHER BUSINESS: Included under Item 9.

11. ADJOURNMENT: Motion by Moorman to adjourn, seconded by King, approved unanimously at 5:20 PM.

Following adjournment members of the Executive Committee met informally to discuss future actions and meetings. Available members will meet in St. Petersburg in November at the ACD workshop and in San Francisco in December 2003 during the AGU Fall meeting. The budget, status of the Secretariat, plans for the Strategic Plan, constitutional issues, guidelines for conference organisation, and status of the 8<sup>th</sup> ICOP and IAC reports would be reviewed, and results reported to the full EC and Council members.

## EXECUTIVE COMMITTEE MINUTES

The following summaries of the two Executive Committee meetings are included for the record. Details are reported in the record of the Council meetings.

### 20 JULY 2003 (11:00 A.M. TO 1:15 P.M.)

The Executive Committee met at the Hotel Rigihof, Zurich. Members present were Vice Presidents Wilfried Haerberli and Felix Are, and Members Jerry Brown and Truls Møllmann; and Hanne Christiansen, International Secretariat. Unfortunately President Hugh French was delayed in London as a result of the airline strike. Both Hugh French and Zhu Yuanlin arrived later in the evening. The members present requested that Vice President Haerberli chair the meeting. The main purpose of the meeting was to

discuss agenda items for the 14<sup>th</sup> Council meeting. The agenda was approved as previously circulated (items 1–16).

1. REVIEW OF MINUTES: The minutes of the last Executive Committee in Arundel, U.K., 2–3 November 2002, were reviewed and approved (summary in *Frozen Ground* 26, p. 4).

2. FINANCIAL REPORT: Christiansen reviewed income and expenses for the past four years. Expenditures for the last year exceeded estimates due to the added expenses in producing and distributing the 66-page issue of *Frozen Ground* 26 and for participation costs in the Zurich conference. If the balance of this year's annual contributions are received, a small surplus will exist (\$5000). It was agreed that *Frozen Ground* should be kept to pre-2002 size and costs, unless supplemental funds become available.

3. STATUS OF 8<sup>TH</sup> ICOP: Haerberli reviewed preparations for the conference. The Executive Committee noted the accomplishments and congratulated the organizing and publications committees for the printed publications, and the planned programme and social events. The organisers expressed disappointment in the lack of field trip participation.

4. FUTURE SECRETARIAT: This discussion was combined with Item 6. Christiansen indicated that she would step down as Secretariat by the end of 2003, but would complete financial accounts and 2004 membership requests. The University Centre in Svalbard (UNIS) is agreeable to maintain the Secretariat in Longyearbyen, Svalbard, but a new person would require salary. The present budget does not provide enough income for both current activities and a salaried Secretariat. Mølmann reviewed recent activities to raise additional funds in Norway, which to date have not been successful. With the increased visibility of the IPA in Norway and the ability to provide more information, the IPA web responsibilities could be undertaken in the Department of Geography, University of Oslo.

5. REVIEW OF BUDGET: The draft budget (2004 to 2008) was reviewed and is based on an estimated annual income and expenditure of \$12,000 from members' contributions.

6. FUTURE FUNDING (see "Future Secretariat" Item 4).

7. REVIEW OF IPA ADMINISTRATIVE STRUCTURE: The IPA organisation as it was presented at the Yellowknife Conference was reviewed (*Frozen Ground* 22, p. 17). No major changes have occurred. It was recognised that the Secretariat is directly involved with Service Centres (IPA and other web sites, GGD, CAPS). The Council should note the linkage between the Secretariat and the Service Centres.

8. REPORT OF THE INTERNATIONAL CONFERENCE ADVISORY COMMITTEE: Johan Ludvig Sollid joined the meeting in the place of Committee Chair Kaare Flaate. A one-page draft IAC report was presented. Haerberli indicated that contacts with the Committee and its Chair were helpful and provided input for continuity between the conferences, but indicated that maintaining uniformity is not always necessary. Brown suggested a more detailed report be prepared and perhaps combined with the ICOP organisers' final report. Both reports should be available by the end of the year. Mølmann raised the question of future membership for IAC. It was agreed that appointments wait until reports of both the IAC and the 8<sup>th</sup> ICOP are submitted, and the new 9<sup>th</sup> ICOP organising committee is identified. Some continuity in membership is desired. Recommendations from the post-Conference Yellowknife report should be reviewed and considered in these reports.

9. STATUS OF WORKING PARTIES: The Committee reviewed the guidelines for the Working Parties and agreed they are still acceptable (*Frozen Ground* 22, p.13). The exception is with Task Forces that have a life of 2–3 years, but remained in place for the full five-year period. Brown then reviewed the status of the existing Working Groups, Task Forces and Committee. Complete reports for the prior four-year period appeared in *Frozen Ground* 26, and were reproduced for Conference attendees in the Extended Abstract volume. Several new Working Groups are expected to be proposed to the Council as well as expanding several Task Forces to WGs, including a joint IPA/ICSI WG on glacier and permafrost.

10. REVIEW OF COUNCIL AGENDAS: The proposed agendas for both the 14<sup>th</sup> and 15<sup>th</sup> Council meetings were reviewed.

11. CONSTITUTIONAL CHANGES: This topic was deferred to the new Executive Committee and Council.

12. STATUS OF ICSI DISCUSSIONS: Haerberli reviewed the background on the International Council on Snow and Ice (*Frozen Ground* 26, pp. 56–57) and recent discussions. ICSI may become the Association for the Cryosphere within the IUGG structure. Presently it does not include engineering. The ICSI status will be resolved over the next six years. Haerberli is a permanent member of ICSI as the representative for the WGMS. The IPA is an important participant in these discussions. As noted, IPA is an affiliated member of the IUGS.

13. OTHER INTERNATIONAL ACTIVITIES: Brown reported on a number of activities. IPA and the Scientific Council for Antarctic Research (SCAR) are considering a joint working group on permafrost and periglacial processes. IPA should consider participation in the International Polar Year (2007/08) and IUGS Planet Earth (2006), and



the new WCRP Climate and Cryosphere (CliC). The IPA Cryosol WG is a joint activity of the International Union of Soil Sciences (IUSS). The Global Terrestrial Network for Permafrost (GTN-P) is co-organised with the WMO GCOS. There are two regional GCOS meetings planned in Asia that warrant follow-up. The Arctic Coastal Dynamics project continues under joint sponsorship with the International Arctic Science Committee (IASC).

14. NINTH CONFERENCE: The official invitation for the 9<sup>th</sup> ICOP from the University of Alaska has been received and will be presented to the Council for approval. There are two other major international conferences in August 2008, and it is important to maintain an appropriate period between ICOP and them.

15. SPONSORSHIP OF OTHER CONFERENCES: Several closely related future IPA conferences are in the planning stages; the Tyumen conference in 2004, the Second European Permafrost Conference tentatively in 2005, and the Chinese regional and Qinghai-Tibet railroad field trip conference in 2006. Russia is interested in hosting the European Conference; details will be discussed in future PACE21 meetings. The IASC is planning the Second International Conference on Arctic Research Planning (ICARP) for October 2005. IPA is invited as a sponsoring organisation and Hanne Christiansen is nominated to be the IPA representative on the Sponsoring Committee. Details of ICARP will be discussed at the Arctic Science Summit Week in Iceland in March 2004.

16. OTHER BUSINESS: There were informal discussions about the award at the 8<sup>th</sup> ICOP in honour of Troy L. Péwé.

22 JULY 2003 (1:15 P.M. TO 3:40 P.M.)

The newly elected Executive Committee (EC) met at the University of Zurich prior to the 15<sup>th</sup> Council meeting. All members were present (Jerry Brown, Charles Harris, Don Hayley, Hans-W. Hubberten, Georgy Perlshtein, and Zhu Yuanlin); Hanne Christiansen, International Secretariat; with Angelique Prick as an invited observer. The Committee reviewed matters arising from the previous EC and 14<sup>th</sup> Council meetings in preparation for the next Council meeting on July 25.

1. SECRETARIAT: The EC agreed to recommend to the Council that the Secretariat remain at the University Centre in Svalbard (UNIS) with the IPA bank account in Norway. Christiansen has agreed to provide limited assistance in the transition while her replacement is recruited. Angelique Prick may be available to assume the position if partially funded. Brown agreed to take responsibility for preparation and production of *Frozen Ground* 27.

2. BUDGET: Projected income for balance of 2003 and 2004

is adequate to support the annual issue of *Frozen Ground*, one meeting of the EC, and limited hourly compensation, but not for the support of working parties activities. New sources of funding are required to support a part-time Secretariat. Members from Norway, U.S., Canada and Germany agreed to explore private and government funding. Any increase in Members' annual contributions should be voluntary through 2004. A detailed summary of actual expenses and income by specific categories is desirable for an annual review.

3. CONSTITUTION: In response to questions (by Council members) relating to procedures on nominations, succession of officers and Members' voting privileges, the EC agrees that a small fact-finding group be appointed to conduct a survey of how other similar organisations address these questions.

4. INTERNATIONAL ACTIVITIES: Numerous conferences are scheduled over the next four years (see Planning Calendar, p. 44). EC and Council members are urged to represent IPA when attending conferences. Important planning and technical meetings in the next 12–18 months include: Climate and Cryosphere in St. Petersburg (November 2003), Arctic Science Summit Week in Iceland (March 2004), a series of engineering meetings in May and June 2004, IGU (Glasgow), IGC (Florence), and several SCAR meetings in Germany. The EC agrees that Hanne Christiansen represent IPA on the Sponsors' Committee for the IASC ICARPII.

5. STRATEGY FOR LONG-TERM PLAN: During the review of the budget, Hayley pointed out the need for IPA to develop a strategic plan with goals and approaches for funding. The EC agreed to develop a plan and to report progress to the Council members over the next year.

6. EC MEMBER RESPONSIBILITIES: Following the tradition established at Yellowknife, each member agreed to certain responsibilities: Brown will maintain cognizance of international activities; Hayley cognizance of engineering activities; Hubberten cognizance of working groups (minus engineering); Harris cognizance of European activities; Perlshtein will provide Russian information to EC; and Zhu Yuanlin will provide Chinese information to EC and communicate about IPA within China.

7. EXECUTIVE COMMITTEE MEETINGS: The full EC would like to meet annually, but if this is not possible, then a quorum of members would meet during other conferences (three of the six). The May Tyumen conference offers the best possibility to convene an open meeting of the entire EC.

8. NINTH CONFERENCE: The EC looks forward to working with the U.S. Organising Committee, and urges it to invite

working group participation in the formal sessions. EC recommends that appointment of a new International Advisory Committee wait until after the 8<sup>th</sup> ICOP committees submit their reports and the U.S. has had an opportunity to identify its organisation (early 2004). The EC feels strongly that an IPA document should be prepared on guidelines for organisation and conduct of ICOPs. The Canadian post-conference report is a good starting point. EC agrees to develop draft guidelines in cooperation with the International Advisory Committee.

9. RESOLUTIONS: The EC reviewed the draft resolutions on international cooperation for presentation to the Council. Brown was asked to follow up on CliC, IPY, SCAR, and ICSI; the last with Wilfried Haeberli, member of the ICSI Bureau. Additional input to resolutions was solicited from other attendees of the Conference prior to the Council meeting.

OFFICERS AND MEMBERS OF THE IPA EXECUTIVE COMMITTEE  
(1983 TO 2008)

	1983	1988	1993	1998	2003
President	P.I. Melnikov U.S.S.R.	T.L. Péwé U.S.A.	Cheng Guodong China	H.M. French Canada	J. Brown U.S.A.
Vice President	T.L. Péwé U.S.A.	Cheng Guodong China	N.N. Romanovskii Russia	F.E. Are Russia	C. Harris U.K.
Vice President	K. Flaate Norway	V.P. Melnikov U.S.S.R.	H.M. French Canada	W. Haeberli Switzerland	G.Z. Perhshstein Russia
Secretary General*	J. Ross Mackay Canada	J. Ross Mackay Canada	J. Brown U.S.A.	H.H. Christiansen Denmark/Norway	to be appointed
Ordinary Members				J. Brown U.S.A.	Hans-W. Hubberten Germany
				T. Mølmann Norway	D.W. Hayley Canada
				Zhu Yuanlin China	Zhu Yuanlin China

\* Replaced by Secretariat in 1998.

## WORKING GROUPS AND STANDING COMMITTEE 2003-2008

During its meeting in Zurich on July 25, 2003, the IPA Council reviewed and approved proposed activities for 10 Working Groups (WG) and the Standing Committee on Data, Information and Communications. Five WGs are new, two of which were previously Task Forces (Mapping and Isotopes). Four WG continue for a second 5-year term, and one was granted an extension of one year to negotiate a new programme with the IGU. Several WGs are joint activities with other international organisations (Cryosol with IUSS; Coastal with IASC, Glacier and Permafrost WG with ICSI). Others such as Astrobiology and Antarctic WGs are developing joint sponsorship. No new Task Forces were requested. Membership on the WGs is open to all those interested in contributing; simply contact the Co-chairs. Members of the IPA Executive Committee will serve as liaison with WGs. All WGs plan to meet and participate in the 9th ICOP and present results of the current activities. For editorial purposes complete names of the acronyms are listed at the end of this document (editor's note: membership of WGs will be posted on web sites starting in 2004). Please refer to Planning Calendar for details on meetings and conferences.

### Working Groups (in alphabetical order)

#### 1. Antarctic Permafrost and Periglacial Environments (New)

Co-chairs:•

- Jan Boelhouwers, Sweden (jan.boelhouwers@natgeog.uu.se)
- James Bockheim, U.S.A. (bockheim@wisc.edu)

Statement of Goals:

- Coordination /communication amongst researchers within IPA.
- Develop an Antarctic permafrost map.
- Develop monitoring/observation protocols (CALM, GTN-P, periglacial processes) and stimulate their implementation.
- Improve mobility and access to the Antarctic by permafrost researchers by means of common research activities in the Antarctic region.
- Data management of existing and new data
- Interaction-collaboration with related IPA WGs (cryosols, astrobiology, planetary and others), and SCAR (RiSCC, PAG), CliC.

These goals will be achieved through the development of an Antarctic permafrost science plan, to be developed in collaboration with PAG (GSSG/SCAR), and to be submitted for approval by SCAR in Bremen, July 2004. The production of an Antarctic permafrost map is proposed to become a contribution to the IPY4 (2007/8).

Proposed meetings, field trips (2004-2007): SCAR symposium, Bremen (July 2004); SCAR/IPA meetings.

Liaison international organisations: CALM/GTN-P; PAG/ GSSG/SCAR; RiSCC/LSSG/SCAR; WCRP/CliC;IPY4.

#### 2. Coastal and Offshore Permafrost

Co-chairs:

- Volker Rachold, Germany (vrachold@AWI-Potsdam.de)
- Nikolai Romanovskii, Russia (nromanovsky@online.ru)

Statement of Goals:

- To plan and implement international projects on the subjects of onshore, transitional and offshore permafrost and hydrates.
- Complete the first phase of Arctic Coastal Dynamics and plan and implement a follow up programme including maintaining the circumarctic key sites.

The activities of the former Coastal Erosion Subgroup are now included in the overall WG goals.

Proposed meetings, field trips (2004–2007): annual Arctic Coastal Dynamics workshops, annual geocryology conference in Pushchino (Tyumen, May 2004); special session at AGU Fall Meeting 2004, and field visits to key sites and Laptev Sea offshore permafrost drilling (2004).

Liaison with international organisations: IASC, LOIRA, IGBP/LOICZ, ACIA, Russian–German Laptev Sea programme and the Otto Schmidt Laboratory, the U.S. Land Shelf Interactions and RAISE programs.

#### 3. Cryosol

Co-chairs

- Sergey Goryachkin, Russia (sergey.gor@mail.ru)
- Eva-Maria Pfeiffer, Germany (empfeiffer@ifb.uni-hamburg.de)

Statement of Goals:

- To develop an Antarctic Soil database and generate an Antarctic Soils map.

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 database 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.

Proposed meetings, field trips (2004-2007): 4th International Cryopedology Conference Apatity, Russia, August 2005; 18<sup>th</sup> World Congress on Soil Science, Philadelphia, PA, July 2006; annual Working Group meetings and Field Excursions to Vorkuta (2004); Iceland, Finland/Norway (2005); and Central Yakutia (2007).

#### 4. Glaciers and Permafrost Hazards in High Mountain Slopes (New)

ICSI/IPA Co-chair:

- Andreas Käab, Switzerland (kaeab@geo.unizh.ch)

IPA Co-chair

- Bernd Etzelmüller, Norway (bernd.etzelmuller@geografi.uio.no)

ICSI Co-chairs

- Jeffrey Kargel, U.S.A. (jkargel@usgs.gov)
- John Reynolds, United Kingdom (rgsl@geologyuk.com)

Statement of Goals:

- Improve international scientific communication on glacier and permafrost hazards.
- Compile state of knowledge related to glacier and permafrost hazards in high mountains.
- Work toward a greater transfer of information and improved communications between the scientific and governmental communities.
- Identify sources of advice for international and national agencies, responsible authorities and private companies.
- Act as a focal point for information for international media during relevant crises.

Proposed meetings, field trips, etc. (2004–2007): EGU General Assembly, 26–30 April 2004, Nice/France: Special session on glacier and permafrost hazards foreseen; XIII Glaciological Symposium, 24–28 May 2004; Fall AGU meetings.

Liaison with international organisations:

This is a joint Working Group between the IPA and the International Commission on Snow and Ice (ICSI). Liaison will be established and maintained with IGS, WGMS, GLIMS, PACE21, and other cryospheric programs and organisations.

#### 5. Isotopes and Geochemistry of Permafrost (New)

Co-chairs:

- Hanno Meyer, Germany (hmeyer@awi-potsdam.de)
- Ron Sletten, U.S.A. (sletten@u.washington.edu)

Statement of Goals:

- Promote the application of isotope and geochemical methods in permafrost research.
- Identify and bring together individuals and groups active in these investigations.
- Facilitate communication with other individuals, programs, and archives that are involved in isotopes and geochemical investigations in polar regions.

Proposed meetings, field trips, etc. (2004–2007): special sessions at international meetings; expeditions and field projects to pursue WG goals (Russian arctic, Alaska, Antarctic).

Liaison with international organisations: GNIP (IAEA), IGS, and others to be identified See web site for more information and names of those who responded to questionnaire as potential members: [www.awi-potsdam.de/www-pof/geo/iostask.html](http://www.awi-potsdam.de/www-pof/geo/iostask.html)

#### 6. Mapping and Modelling of Mountain Permafrost (New)

Co-chairs:

- Dmitry Stepanovich Drozdov (ds\_drozdov@mail.ru)
- Sergei Marchenko (ffssm1@uaf.edu)
- Rune Strand Ødegård (rune.oedegaard@hig.no)

Statements of goals:

- Main goal is to further develop systematic strategies for mapping and modelling mountain permafrost.

Subgoals are:

- Develop an international set of accepted legends at different map scales to be used for mountain permafrost maps.
- Promote mountain permafrost mapping in central Asia.
- Encourage further development of 2D, 3D and 4D (including time) models of permafrost in mountain regions.

The tasks are organised in two subgroups:

- The mountain permafrost modelling subgroup will promote mountain permafrost modelling in both time and different spatial scales chaired by Rune S. Ødegård.
- The regional mapping subgroup will focus on permafrost mapping in Central Asia chaired by S.S. Marchenko and D. S. Drozdov.

The objective will be to first analyse the experience of permafrost mapping in the different countries and choose or elaborate on the most acceptable method of classifying and mapping the permafrost of Central Asia. The second objective will be to elaborate on a uniform legend for the map and finally the compilation of a unified regional permafrost map at a scale of 1:2,500,000.

Proposed meetings:

Tyumen, Russia 22–29 May 2004 (First organisational meeting of the working group); Plateau field trip 2006

Liaison international organisations: coordination with other working groups; PACE21, IGS.

#### 7. Periglacial Processes and Environments (one-year extension)

Co-chairs

- Ole Humlum, Norway (ole.humlum@geo.uio.no)
- Norikazu Matsuoka, Japan (matsuoka@atm.geo.tsukuba.ac.jp)

#### Statement of Goals:

A one-year extension was approved so that the Working Group can consult with the International Geographical Union (IGU) on the organisation of new joint activity related to cold climate surficial processes. Progress will continue on the web based field manual and publication of the special issues of the journal Permafrost and Periglacial Processes.

Proposed meetings, field trips, etc. (2004–2007): IGU August 2004

Liaison with international organisations: IGU as co-convenor of Commission on Climate Change and Periglacial Processes (CCPP). Jef Vandenberghe (Netherlands) is chair and Julian Murton (United Kingdom) is Secretary of the CCPP.

### 8. Permafrost and Climate

#### Co-chairs:

- O.A. Anisimov, Russia (oleg@OA7661.spb.edu)
- F.E. Nelson, U.S.A. (fnelson@udel.edu)

#### Subgroup Chairs

- Model Inter-comparison: V. Romanovsky, U.S.A. (ffver@uaf.edu)
- Monitoring: S. Smith, Canada (SSmith@NRCan.gc.ca)
- Processes (interim activity): T. Osterkamp, U.S.A. (t.osterkamp@worldnet.att.net)

#### Statement of Goals:

- Overall goal is to investigate the interactions between permafrost and climate; past, present and future.

#### Specific goals include:

- Propose cartographic and conceptual bases for representing changes in permafrost distribution.
- Undertake an international approach to inter-comparison of active layer and permafrost models.
- Coordinate active layer and borehole monitoring programs under GTN-P.
- Identify critical processes and measurements in heat and mass transfer.

Proposed meetings, field trips (2004–2007): special sessions at annual Fall AGU meetings and annual Russian geocryology conferences in Pushchino (Tyumen, May 2004)

Liaison with international organisations: IPCC, ACIA, CliC, WMO/GCOS and FAO/GTOS/TEMS

### 9. Permafrost Astrobiology (New)

#### Co-chairs:

- David Gilichinsky (gilichin@issp.serpukhov.su)
- Christopher McKay (cmckay@arc.nasa.gov)

#### Statement of Goals:

- Develop cooperation between earth and biological sciences on the interaction of knowledge for the spatial and temporal limits of the deep cold biosphere on and beyond the Earth, and in the search for extraterrestrial life.
- Bring together scientists and spacecraft engineers for planning future Martian missions, relevant to astrobiology.
- Foster studies on terrestrial permafrost as analogue for extraterrestrial areas of potential sites for life, and conduct field campaigns focused on aseptic sampling of ancient permafrost/ground ice in search of preserved microorganisms and biosignatures.
- Explore terrestrial permafrost, ground ice and ice-covered areas for field calibration of space techniques employing geocryological/glaciological experience for interpretation of the space-related remote sensing and satellite imagery and data in the analysis of periglacial planetary features.

Proposed meetings, field trips (2004–2007): European Conferences on Exobiology/Astrobiology, Fall AGU meetings, annual Russian geocryology conference (Tyumen, May 2004); Biennial COSPAR (Paris, summer, 2004) conferences; and special aseptic drilling activities in Canadian Arctic, Siberia and Antarctic Dry Valleys

Liaison with international organisations: NASA Astrobiology Institute (NAI); European Astrobiology Network Association (EANA)

### 10. Permafrost Engineering

#### Co-chairs:

- Arne Instanes, Norway (arne.instanes@instanes.no)
- Ted Vinson, U.S.A. (Ted.Vinson@orst.edu)

#### Statement of Goals:

- Document impact of climate change on infrastructure including observations, monitoring and case studies.
- Evaluate potential participation in deep drilling project related to oil and gas exploration.
- Consider developing hydrology and geophysics subgroup or Task Force.
- Work with Organising Committee to develop permafrost engineering sessions at the 9<sup>th</sup> ICOP.

Proposed meetings, field trips (2004–2007): biennial Cold Regions Engineering Conferences (May 2004; 2006); annual Russian geocryology conferences in Pushchino (Tyumen, May 2004); Ground Freezing and Frost Action in Soils, Quebec (Spring 2005); China conferences (fall 2004, summer 2006)

Liaison with international organisations: ISSMGE TC8, ASCE/TCCRE, CGS, SCOPE, ACIA, IPCC.

## Standing Committee on Data, Information and Communications

### Co-chairs

- Roger Barry, U.S.A. (rbarry@kryos.colorado.edu)
- Sharon Smith, Canada (ssmith@nrca.nrc.ca)

### Statement of Goals:

- Implement IPA strategies for data recovery, archiving and development of data and information products including GGD and CAPS Version 3.0 for 2008.
- Communicate information within and external to the permafrost communities (e.g., IPA, GTN-P, and Frozen Ground web sites, *Frozen Ground*, CAPS CDs).
- Prepare subject index to 8<sup>th</sup> ICOP proceedings and extended abstracts, and develop plans for cumulative indexes and CD of previous ICOP proceedings.

Proposed meetings, field trips (2004–2007): Presentations and posters at annual meetings of AGU, Pushchino conferences, and other IPA-related international and national conferences (North America, Europe, China, Russia) including ICARP II (October 2005).

Liaison with international organisations: WCRP/CliC; WMO-FAO/GCOS/GTOS; ICSI; WDCs for Glaciology, IASC/ICARP II, SCANNET.

### Acronyms (IPA coordination and liaison)

ACD: Arctic Coastal Dynamics	IGBP: International Geosphere Biosphere Program
ACIA: Arctic Climate Impact Assessment	IGU: International Geographical Union
ASCE/ American Society of Civil Engineers	IPCC: Intergovernmental Panel on Climate Change
ASTM: American Society for Testing and Materials	ISOPE: International Society of Offshore and Polar Engineers
AGU: American Geophysical Union	ISSMGE TC8: International Society of Soil Mechanics and Geotechnical Engineering: Technical Committee 8
CALM: Circumpolar Active Layer Monitoring	ITEX: International Tundra Experiment
CAPS: Circumpolar Active-layer Permafrost System	IUGS: International Union of Geological Sciences
CCPP: Commission on Climate Change and Periglacial Processes (IGU)	IUSS: International Union of Soil Science
CEON: Circumarctic Environmental Observatory Networks	LOICZ: Land-Ocean Interactions in the Coastal Zone (IGBP)
CLIC: Climate and Cryosphere (WCRP)	LOIRA: Land-Ocean Interaction in the Russian Arctic
CGS: Canadian Geotechnical Society	LSI: Land Shelf Interactions
COSPAR: Committee on Space Research	LSSG: Life Sciences Scientific Standing Group (SCAR)
EANA: European Astrobiology Network Association	NAI: NASA Astrobiology Institute
EU: European Union	PACE 21 Permafrost and Climate in Europe
FAO: Food and Agriculture Organization of the United Nations	PAG: Permafrost Action Group (SCAR)
GCOS: Global Climate Observing System	RAISE: Russian American Initiative on Shelf Environments
GCP: Global Carbon Project	RiSCC: Regional Impact Sensitivity of Climate Change
GLIMS: Global Land Ice Monitoring System	SCANNET: Scandinavian-North European Network of Terrestrial Bases
GNIP: Global Network for Isotopes in Precipitation	SCAR: Scientific Committee for Antarctic Research
GSSG: Geosciences Scientific Standing Group (SCAR)	TEMS: Terrestrial Ecosystems Monitoring Sites
GTN-P: Global Terrestrial Network for Permafrost	TCCRE: Technical Council on Cold Regions Engineering
GTOS: Global Terrestrial Observing System	WCRP: World Climate Research Program
IAEA: International Atomic Energy Agency	WDC: World Data Centers for Glaciology
IAG: International Association of Geomorphologists	WGMS: World Glacier Monitoring Service
IASC: International Arctic Science Committee	WMO: World Meteorological Organization
ICARPII: International Conference for Arctic Research Planning II	WRB: World Reference Base for Soil Resources (IUSS)
ICSI: International Commission on Snow and Ice	
IGS: International Glaciological Society	

## IPA COUNCIL RESOLUTION ZURICH, SWITZERLAND, 25 JULY 2003

### RESOLUTION 1: PLANNING AND IMPLEMENTING ACTIVITIES THAT CONTRIBUTE TO INTERNATIONAL PROGRAMS

Recognising the inter- and multi-disciplinary nature of permafrost science and engineering and its representation in many diverse bodies, scientific unions, associations, and professional societies with related interests, the International Permafrost Association resolves to endorse and participate in the continuation of existing collaboration and the establishment of new joint programs including, but not limited to:

- Continuation and expansion of the IPA-coordinated, GCOS/GTOS Global Terrestrial Network-Permafrost (GTN-P) monitoring programme including CALM, PACE, and other networks (see Yellowknife Resolution 1, 1998);
- Planning and implementation of the WCRP Climate and Cryosphere (CliC) Project Area on Terrestrial Cryosphere, and other WCRP related projects (GEWEX, CLIVAR);
- Developing a joint project with ICSI on ice–permafrost interactions;
- Planning and participation in the Fourth International Polar Year (IPY4 2007/8) and other related programs including the IUGS Planet Earth project (2004/7);
- Planning and implementation of an Antarctic Permafrost and Periglacial Working Group and the development of a programme in cooperation with SCAR (see Yellowknife Resolution 2, 1998);
- Coordination of a planetary permafrost activity and development of a Working Group with interests on both biological and physical processes;
- Participation in international planning conferences including the IASC organised Second International Conference on Arctic Research Planning (ICARP II/2005); impact assessments (IPCC, ACIA); and symposia such as the Northern Research Basins (NRB);
- Development of a new IGU/IPA agreement for an IGU Commission related to cold regions processes;
- Contributions to the planning and implementation of relevant IGBP projects and activities such as the Mountain Research Initiative and LOICZ, as well as the Earth System Science Partnership project on Global Carbon, among other programs; and
- Participation in relevant national and regional programs such as SEARCH, CRYSYS, and existing and new national committees that address cryology (National CliC Committees in China, Japan, Russia, etc.).

### RESOLUTION 2: COORDINATION OF ACTIVITIES RELATED TO PERMAFROST RESPONSES TO CLIMATE CHANGES

Recognising that responses to climate are complex and multiple-dimensional in both time and space, and that currently many of these complex problems are approached at various scales and levels of resolution by individuals and small teams of experts, be it resolved that the IPA Working Parties consider several key problems that include, but are not limited to:

- Examination of the development of a unified approach to the definition of permafrost and delineation of permafrost boundaries at various spatial resolutions and scales (for past, present, and future climate scenarios);
- Inter-comparison of regional and global models and development of models for diverse environmental conditions.
- Mapping of existing permafrost and ground-ice conditions and monitoring of changes at regional and continental scales (including mountains);
- Assessing responses of permafrost processes (including coastal, slope, geomorphic) to changes in environmental forcing;
- Assessing responses of infrastructures to changing permafrost regimes; and
- Continued development of the Global Geocryological Database (GGD) and updating of metadata and archives related to permafrost-climate investigations.

Furthermore, accomplishments resulting from these resolutions be reported periodically at appropriate scientific and engineering meetings and at the 9<sup>th</sup> International Conference on Permafrost, in Fairbanks, Alaska, June 2008.

## NEWS FROM MEMBERS

Members are encouraged to submit periodic updates of activities for posting on the IPA Web site.

### ARGENTINA

*IANIGLA: 30 Years of Basic and Applied Research on Environmental Sciences* was published by IANIGLA (Argentine Institute for Snow Research, Glaciology and Environmental Sciences), "Instituto Argentino de Nivología, Glaciología y Ciencias Ambientales." The book, edited by Dario Trombotto and Ricardo Villalba, is dedicated to the scientific work of Arturo Corte and contains, among the many multidisciplinary topics, seven contributions on geocryology. The book is intended for a wide community of readers. The same Cuyo University Press of Edificios, Mendoza, published the book written by Juan Schobinger, *The Incaic Sanctuary of Mount Aconcagua*, about the mummy found in the permafrost at an elevation of 5300 on Mount Aconcagua (6959 m asl, Central Andes of Mendoza).

The research project "Geocriología Argentina General y Aplicada" financed by the National Research Council (CONICET) of Argentina continued. Thermistors were installed on the Morenas Coloradas rock glacier in Vallecitos, Cordón del Plata, Mendoza. A new georeference point in relation to the first one (Balcón I at 3560 m asl) was established (Balcón II) at an elevation of 3770 m. The temperatures of the active layer were measured to the 3-m depth, the top of the permafrost. The new data are integrated into Worldwide Network of Climate Observations (SMOC). Another area studied is at the Laguna del Diamante associated with the Volcano Maipo. An inventory of landforms and cryogenic soils was conducted, and geophysical soundings and soil temperature recording are in preparation.

In co-participation with the LEGAN (Argentine Antarctic Institute, Alberto Aristarain), Mendoza and CNEA (National Commission of Nuclear Energy, José Ruzzante), Buenos Aires, the Geocryology Unit of the IANIGLA joined the international research project "Acoustic emission of the volcano Peteroa." It is a geophysical, geological and glaciological project with the participation of Italian researchers from the Institute of Acoustics in Rome. The study areas were extended to the south of the province of Mendoza interrelating the topic volcanism (Peteroa is an active volcano) with the Andean periglacial. New sites for the collection of data on climate and cryogenic soil are being selected. These new sites would help to complete the existing cartography, shifting southwards and would be part of the ongoing elaboration of an Argentine and South American map of permafrost and periglacial environments.

In close cooperation with R. Villalba, IANIGLA, Men-

doza, the project continued on the integration of instrumental, dendrochronological and glaciological registers and climate variability in Patagonia during the last 1000 years. It was possible to study the periglacial areas corresponding to the transects in the Humid Andes between approximately 39 and 43 S (Volcán Lanín, Cerro Tronador, Cordón del Pico Alto and Cerro Torrecillas), as well as the Patagonian Andes on the Argentine side between approximately 47 and 50S (Cerro San Lorenzo, Sierra de Sangra, Cerro Hatcher, Cerro Fitz Roy, Torre and the borders of the Southern Patagonian Ice Cap). These studies revealed excellent examples of periglacial cryogenic microforms and new examples of rock glaciers.

Since 2001, geomorphologists from the Humboldt University Berlin have been studying periglacial geomorphology and, in particular, rock glaciers of the semi-arid Andes of Central Chile. Alexander Brenning is now modeling rock glacier distribution in relation to the measured velocity by A. Lamm and T. Wittkopf. Additional emphasis is placed on the hydrological significance of rock glaciers in the Andes of Central Chile. First results indicate that in many catchment areas, more water is stored in rock glaciers than in 'true' glaciers. There is close contact among the Dirección General de Aguas, the Catholic University of Santiago, the IANIGLA at Mendoza/Argentina (D. Trombotto), and local contacts.

Dario Trombotto  
(dtrombot@lab.cricyt.edu.ar)

### AUSTRIA

The Institute of Geodesy of Graz, University of Technology has carried out in close cooperation with the Institute of Image Processing (Joanneum Research) several studies on detection and quantification of rock glacier movement using various measuring techniques, i.e., geodesy, digital photogrammetry, terrestrial laser scanning, and SAR interferometry. Results of these investigations were reported at 8<sup>th</sup> ICOP. Currently the observational network consists of four different rock glaciers in the Austrian Alps. Special emphasis has been placed on the development of a photogrammetric software package for the automatic measurement of 3-D surface displacement vectors in time-series of multi-year digital aerial photographs. The Graz group has also contributed to the final report of the IPA/ICSI Task Force on Permafrost creep and rock glacier dynamics.

Other activities on permafrost research in the Austrian Alps comprise hydrological and geophysical measurements (seismic, gravity, and radar) on several rock glaciers as well as monitoring of ground temperatures. Furthermore mapping of relict and active rock glaciers has recently become part of standard geological surveys. Of special interest is the establishment of a new organisation involved in research on natural hazards in alpine environments;



the “alps-Zentrum für Naturgefahren” in Innsbruck ([www.alps-gmbh.com](http://www.alps-gmbh.com)). Its goal is to develop sustainable strategies, technologies and systems to assess and deal with hazards in a comprehensive way. Without doubt, permafrost will play an important role in these activities.

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## CANADA

Like many of our international colleagues, the 8<sup>th</sup> International Conference in Zurich was a highlight for the Canadian permafrost community, and an opportunity to renew friendships, exchange ideas and discuss new collaborations. This Canadian report is thus brief and touches upon a few select news items and recent developments.

A federal interdepartmental initiative, led by the Department of Indian Affairs and Northern Development (DIAND), completed, in the summer of 2003, a bio-physical research gaps analysis for northern energy and pipeline development and associated government preparedness in the Mackenzie Valley. Short-term (two year) proposals addressing priority gaps have been funded and proposals for longer term (2 to 5 or more years) are under development. Short-term projects include several permafrost and terrain studies in the Mackenzie Valley and Delta—many of which will be led by the Geological Survey of Canada (GSC). Energy and pipeline related permafrost studies in the western arctic (onshore, coastal and offshore) also continued to be funded by the federal Panel on Energy Research and Development (PERD). (Contacts at the GSC: M. Burgess, S. Smith, F. Wright, S. Solomon, S. Dallimore). In summer 2003, the Mackenzie Gas Producers group filed a preliminary information package for a Mackenzie Valley Gas pipeline. The regulatory review process is expected to take place over a three-year period.

Beaufort Sea Scientific Cruise to Investigate Submarine Features: In September scientists from the Geological Survey of Canada (GSC), Department of Fisheries and Oceans (DFO), Monterey Bay Research Aquarium (MBARI) and the U.S. Geological Survey (USGS) undertook a joint cruise in the Beaufort Sea on the Canadian Coast Guard ship *Laurier*. The collaborative project investigated submarine pingos and pock mark features, with the goal of establishing the origin of these features and assessing their possible relationship to degrading gas hydrates and contemporary marine permafrost processes. The cruise combined a number of disciplines; GSC providing the geologic overview, detailed geophysics, permafrost and stratigraphic framework, MBARI leading an extensive pore water geochemistry program (geochemical proxies to ascertain methane flux rate, isotope geochem etc.), USGS assessing the geochemistry of the gases to determine provenance and DFO conducting a wide variety of water column and oceanography studies. A variety of bottom-founded temperature and oceanographic moorings were deployed and ROV studies

of pingo morphologies were carried out. Considerable shallow coring was carried out in and around these features and in background areas. Possible evidence of ice bonding and observation of considerable visible ice of a very distinctive character and distribution were features of the coring in this region of submarine permafrost. Information gathered on this cruise will add to the study of shallow permafrost in this remote environment.

Research on “Massive Ice in Granular Resources:” With support from PERD and DIAND a team from McGill University initiated research into the nature, origin, distribution, extent and significance of massive ground ice in coarse-grained deposits focusing on sites in the Mackenzie Delta region of the western Canadian Arctic. Building upon previous studies this research utilizes a combination of geophysical, stratigraphic, laboratory and field mapping techniques. The laboratory component is concerned with physical and chemical analyses of ice and sediment to determine the age and origin of massive ice bodies. The field component focuses on geophysical and topographic mapping. Results will facilitate characterization of the sensitivity of these sediments to natural or anthropogenic disturbance, as well as providing information about massive ice occurrence in coarse sediments. Contacts: Greg DePascale, Wayne Pollard and Bob Gowan.

Mallik 2002 Gas Hydrate Production Research Well Program Results Release: In 2002, the Mallik partnership drilled three wells to 1166+ m to intersect and investigate a major gas hydrate field in the Mackenzie Delta of the northwestern Canadian Arctic. The wells, at a 50-m spacing, consisted of a production test well and two observation wells on either side. A major achievement of the program was the first modern production test of natural gas hydrates. The two observation wells facilitated cross-hole tomography experiments before, during and after several production tests. An extensive suite of open-hole logs and advanced gas hydrate logging tools were run. Continuous wireline core was recovered through the hydrate intervals and a multi-disciplinary science team of some 100 scientists undertook supporting research.

Partners in the 2002 Mallik Program planned to release the results at an International Symposium “From Mallik to the Future” in Chiba, Japan, December 8–10, 2003. The Symposium was the first public release of the production test results and hydrate science research from the Mallik research wells. The Symposium planned to conclude with research priorities for exploration of future hydrate production and to further international collaboration in this important field. Further information on the Mallik gas hydrates research program is found on the websites: [gashydrate.nrcan.gc.ca](http://gashydrate.nrcan.gc.ca); [www.mh21japan.gr.jp](http://www.mh21japan.gr.jp).

The Mallik partners are: Geological Survey of Canada (GSC), Japan National Oil Corporation (JNOC), GeoForschungsZentrum Potsdam (GFZ), United States Geological Survey (USGS), United States Department of

Energy (USDOE), India Ministry of Petroleum and Natural Gas (GAIL/ONGC), BP-Chevron-Burlington Joint Venture Group and International Continental Scientific Drilling Program (ICDP).

Workshop Towards the Establishment of a Canadian CliC Program: The World Climate Research Programme initiated a new project on Climate and Cryosphere (CliC) in March 2000 to study important cold regions processes at a global scale. CliC addresses the entire cryosphere—snow, sea and freshwater ice, ice sheets, glaciers and ice caps and frozen ground, including permafrost. The CliC Science and Coordination Plan and draft Implementation Plan are at <http://clic.npolar.no>.

The international science community is looking to Canada to provide a leadership role in many areas of cryospheric research. To this end a workshop was scheduled in Victoria, November 30–December 1, 2003, to develop the framework for a strong, but realistic, Canadian contribution to CliC.

Upcoming Special Event: In recognition of Dr. Hugh French's (Past President of the IPA) many achievements and contributions to the fields of periglacial geomorphology and permafrost studies over a 40-year period, a special session is being organised in his honour at the joint meeting of the Canadian Geomorphology Research Group (CGRG) and l'Association Québécoise pour l'Étude du Quaternaire (AQQUA). The meeting will be held in Québec City in May 2004, and the organisers are hoping for a full day of presentations and the subsequent publication of the papers as a special issue of *Permafrost and Periglacial Processes* (Volume 15, no. 4). For further information, contact: Antoni Lewkowicz ([alewkowi@uottawa.ca](mailto:alewkowi@uottawa.ca)).

Branko Ladanyi, Professor Emeritus, Ecole Polytechnique, was awarded the 2003 Harold R. Peyton Award by the American Society of Civil Engineers, "in recognition of his unstinting efforts in promotion and practicing in the field of Cold Regions Engineering, with particular emphasis on engineering education and research into creep behavior of permafrost soils." Congratulations, Branko, and we would also like to acknowledge your long-standing contributions to the IPA's Permafrost Engineering Working Group.

An initial issue of papers translated into English from the Russian journal of permafrost studies: 'Kriosfera Zemli' has been published with the title 'Earth's Cryosphere.' Publication will continue either with a complete translated version of each issue of the original Russian or as periodic issues of selected papers. This project has been undertaken as a collaboration between the Russian Academy of Sciences, Siberian Branch, the Scott Polar Research Institute in Cambridge, UK, and the Canadian organisation [freezingground.org](http://freezingground.org). The translation and preparation of articles is carried out to a particularly high standard, with assistance from Russian and English-speaking linguists and permafrost specialists. The publication is intended to strengthen

understanding in the rest of the world of Russian permafrost science and engineering. For enquiries and subscription information, contact [earthscryosphere@freezingground.org](mailto:earthscryosphere@freezingground.org)

A second edition of the English version of the Geocryological Map of Russia and Neighbouring Republics (Carleton University, Canada, Moscow State University, Russia, and Scott Polar Research Institute, Cambridge, U.K. 1998) has been published (2003). It includes a number of revisions of definitions and interpretation, as well as significant technical improvements facilitating use of the English Version. The Map is an important illustration of Russian permafrost science as used in pipeline route selection and similar applications. Samples are shown at: [www.freezingground.org/map](http://www.freezingground.org/map). Enquiries and purchases: [map@freezingground.org](mailto:map@freezingground.org).

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## CHINA

In addition to construction of the Qinghai-Tibet and the Qinghai-Kangding highways, construction of the Qinghai-Tibet Railroad is one of the main projects in the permafrost region of China. Permafrost remains one of the significant problems in the construction of the railroad. Climate warming and the warm condition of permafrost with its high ice content will influence roadbed stability. In order to protect the permafrost and ensure the stability of the roadbed, new approaches for cooling embankments are proposed. Under the research programme on the interaction of climate, permafrost and engineering, new principles and technologies for adjusting and controlling permafrost ground temperature are being developed. Thus far, and based on research at three experimental field sites and laboratory tests, the main measures employed are the use of thermopiles and crushed stone embankments. The railroad has entered more than 100 km into the permafrost region. Many institutes of the Ministry of Railways, the Ministry of Communications, and the Chinese



*Ventilated embankment of crushed stone. (Photograph provided by Ma Wei.)*

Academy of Sciences are taking part in this engineering research.

Research under the grant entitled "Interaction between Qinghai-Tibet Railway Engineering and Permafrost and Environmental Effects" and sponsored by the Knowledge Innovation Programme of the Chinese Academy of Sciences is in progress. This programme was directed mainly to the State Key Laboratory of Frozen Soil Engineering, CAREERI, CAS. The research topics are:

- Research on the stability of permafrost in the construction of the railroad.
- Research on the mechanism of freeze-thaw damage and the prevention and countermeasures along the railroad.
- Interaction between climate and permafrost along the railroad.
- Interaction between engineering structures and permafrost along the railroad.
- Research on the stability of railway embankment under dynamic loading and the engineering characteristics of saline soils in the permafrost region of Qinghai-Tibet Plateau.
- Exploiting research on the "digital roadbed" and the emulation system.
- Application research on the forecasting of and recovery from thunderstorm-induced disasters on the Qinghai-Tibet Plateau.

The Sixth International Symposium on Permafrost Engineering will be held September 5–7, 2004, in Lanzhou, China, organised by the Society of Glaciology and Geocryology, a Branch of the Geographical Society of China, the State Key Laboratory of Frozen Soil Engineering (CAREERI, CAS), the First Railway Survey and Design Institute and United Institute of Permafrost Research and Natural Resources Development (SB, RAS), among others. The Symposium will discuss and exchange research achievements and practical experiences in permafrost engineering science and technology. The themes are:

- Physics and mechanics of frozen soil
- Construction and operation of engineering structures in permafrost regions
- Linear construction in permafrost regions
- Environmental protection in permafrost regions
- Monitoring methods and technique for cold regions engineering

The deadline for submission of abstracts is January 1, 2004, and for submission of papers for publication April 1, 2004. A seven-day field excursion from Lanzhou to Lhasa will provide an opportunity for symposium participants to visit construction sites along the Qinghai-Tibet Railway.

An International Regional Permafrost Conference in Lanzhou in summer 2006 and the post-conference field excursion along the Qinghai-Tibet railway and highway

are being organised. Topics focus on the countermeasures for solving engineering problems in construction of Qinghai-Tibet railway and highway.

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## FRANCE

A number of new projects related to morphodynamics in periglacial environments were investigated at the CNRS UMR 6143, Caen, France (D. Amorese, J. P. Coutard, A. Dubois, M. Font, G. Guillemet, J.L. Lagarde, J.C. Ozouf). Laboratory simulation of scarp degradation under periglacial environments was carried out in a cold laboratory where temperature (freeze-thaw cycles), precipitation, and lithology (heterogeneous cryoclasts) were controlled. This experiment was funded by the French "Programme National Risques Naturels".

The main periglacial slope processes that have been recognised involve cryoreptation, debris flows and gravity-driven mass slips.

Landform evolution was characterised by development of concave scarp profiles, scarp ablation as a consequence of debris flows and final slope softening.

Quantification of the displaced material volume, along the experimental scarp, leads to values about  $1 \text{ cm}^3/\text{cm}^2$  for 41 freeze-thaw cycles. These results have been compared to field data relative to scarp erosion under moist periglacial conditions along the La Hague-Jobourg Fault Zone (North Cotentin, Normandy).

Collaborations exist also with the University of Sussex (Julian Murton) on a research programme on "Bedrock fracture by ice segregation", funded by the Natural Environmental Research Council. A new project will start in 2004 on physical modelling of mass-movement processes on permafrost slopes, in collaboration with the Cardiff group (Charles Harris). It is proposed that both full-scale (Caen refrigerated tanks) and small-scale physical modelling (Cardiff geotechnical centrifuge) be developed to investigate mass movement processes in clay-rich soils, and at steeper gradients.

Members of the polar team of the laboratory of physical geography of Clermont-Ferrand (GEOLAB, UMR 6042-CNRS) are carrying out a research programme supported by the French Polar Institute in Northwest Spitsbergen. The main objective is to investigate time-space relations among periglacial, paraglacial and glacial dynamics. Particular attention is drawn to the increasing role played by meltwaters in the contemporary paraglacial context, with severe dissection of till deposits and progradation of the coastline. In Iceland and Antarctica, the interplay and succession of weathering processes are being examined by combining detailed geomorphological mapping, micro/nanoclimate monitoring, SEM observations and XRD analyses (in collaboration with UNBC and BAS in Antarc-

tica). The role of biological, thermal and chemical weathering processes is being emphasized due to the lack of moisture and/or to the low susceptibility of bedrock to frost-derived mechanisms.

A diachronous fluvial forms analysis of the Lena River (satellite images and Navigation Survey maps) has been conducted by E. Gautier and D. Brunstein (Laboratoire de Géographie Physique, UMR 8591, Meudon). This meso-spatial-scale approach allows evaluation of the effects of thermal erosion on fluvial units' mobility. On the basis of sedimentary structure observation, the specificity of the depositional processes is underlined and deposits associated with logjams and ice-jams are identified. High recession rates are observed along some Siberian river banks. A laboratory simulation experiment and physical approach were continued by F. Costard, L. Dupeyrat, R. Randriamazaoro and E. Gailhardis (OrsayTerre, CNRS-UPS FRE2566), and have demonstrated that exceptional erosion rates can be best explained in conjunction with high water temperatures, and that mechanical erosion is associated with some particular geometry of the channel.

On Mars, polygons formed by networks of cracks from 50 to 300 m large and undifferentiated patterned ground at smaller scale are usual. They occur on about 500 high resolution images and are distributed especially in high latitude regions. The interstitial ice is stable in the first meters only at high latitudes because of the low content of water vapor in the atmosphere. This has been recently confirmed by Neutron Spectrometer data on board the Mars Odyssey spacecraft. Maps proposed by Nicolas Mangold (Orsayterre, CNRS-Université d'Orsay) show a very good correlation between the ice-rich ground detected by the probe and the polygons, regardless of their size, thus indicating that they most likely formed by periglacial processes such as thermal contraction. François Forget (Laboratoire de Météorologie Dynamique, Jussieu) currently investigates the climatic control of these features including past periods of seasonal freeze–thaw cycles that could have formed features such as sorted circles, stripes or pingos. The understanding of these landforms will improve our knowledge of the recent climate on Mars.

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## GERMANY

A coastal permafrost drilling transect was undertaken in the western Laptev Sea in April 2003 under the framework of the Russian-German cooperation in the Laptev Sea (Hubberten, Alfred Wegener Institute for Polar and Marine Research, Potsdam). The Russian team was headed by M.N. Grigoriev (Permafrost Institute, Yakutsk). A transect perpendicular to the shoreline and consisting of 15 permafrost boreholes with depths of up to 30 m was drilled.

The sixth expedition to the Lena River Delta took place

in July 2003 under the leadership of the AWI-Potsdam. Microbial methane production and turnover rates during the freeze back and thawing of the active layer were investigated. Within the scope of the Expedition "Lena-New Siberian Island–2002" the Late Pleistocene permafrost sediments were drilled and transported in the frozen state to Germany.

A joint Russian–American–German expedition took place between May and late August to Lake Elgygytgyn in northeastern Siberia. German scientists from Leipzig University and AWI carried out seismic studies of the sedimentary sequence of this impact crater lake, permafrost studies surrounding the lake, observations of the recent hydrological system, and coring of sediments.

A Russian-German joint project investigating the Late and Middle Quaternary in the Verkhojansk Mountains, Yakutia, is currently in progress by the Universities of Bayreuth and Aachen, and the AWI Potsdam. Research topics include periglacial and glacial forms and processes, and the Late Quaternary climatic change derived from ice wedges, relict soils and glacial sediments.

The research group of the Department of Geography, University of Bonn (R. Dikau) continues geomorphological and permafrost research in Turtmanntal, Valais, Switzerland. A Ph.D. thesis on morphometric landscape analysis (Rasemann) was completed, and another Ph.D. project started (Otto). The main focus is on permafrost and rock glacier distribution. The permafrost distribution and sediment storage of rock glaciers by means of geophysical methods and the analysis landscape structure is carried out by M. Nyenhuis. I. Roer continues the monitoring of rock glacier kinematics using remote sensing techniques and terrestrial surveying.

The Institute for Geography, University of Giessen (L. King) continues permafrost temperature monitoring in the Matter Valley, Stockhorn Plateau and Ritigraben. Shallow ground temperature data recorded at Gornergrat at 3000 m asl indicates that permafrost is confined to coarse materials, while it is absent in fine-grained substrates (S. Philippi). However, temperature measurements at Ritigraben block slope (T. Herz) at only 2615 m asl are remarkably cold, mainly due to differences in snow cover development and depth.

Permafrost investigations continued in various projects in the Department of Geography in Jena. A new model routine called CLOUDMAP as part of PERMAP (M. Hoelzle, ETH) accounts for the higher amount of diffuse radiation in the northern Alps and calculates the distribution of permafrost by use of global radiation as the controlling factor. This routine was developed by O. Mustafa and M. Gude (Jena) within the EU-project PACE. Studies on alpine permafrost distribution and its geotechnical significance at the highest peak in Germany (Zugspitze, 2964 m asl), started by M. Gude and D. Barsch (Heidelberg) within the PACE project, continue in cooperation with the Bavarian Geological Survey and a local tourist company. Non-alpine sporadic permafrost is investigated

in highland scree slopes in Germany, Czech Republic and France (M. Gude) in the interdisciplinary Scree Ecosystems research programme (SCREECOS). Terrestrial biosphere modelling focuses on the influence of permafrost on biomass productivity in northern areas (Ch. Schmulilius, EU-project SIBERIA II) in cooperation with Ch. Beer, M. Gude (Jena) and W. Lucht (Potsdam).

At the Institute for Meteorology and Climate Research, University of Karlsruhe, new geophysical investigation and data processing schemes are being developed for ground-ice detection and permafrost monitoring in mountain regions (C. Hauck). Field studies are conducted at sites with likely permafrost occurrence in Germany and Switzerland in collaboration with the Universities of Würzburg (C. Kneisel), Jena (M. Gude), Freiburg (C. Schneider), Zurich (M. Hoelzle) and ETH Zurich (H. Maurer). High-altitude sites are investigated (e.g. Schilthorn, Swiss Alps) as well as those with isolated ground-ice occurrences at low altitude (e.g. in middle mountain ranges). Numerical experiments of the energy exchange processes between permafrost and atmosphere are conducted using different coupled ground-atmosphere models.

At the Department of Geo- and Agroecology, ISPA, University of Vechta, G. Broll continues the long-term ecosystem monitoring in the Canadian Arctic. Research is carried out in the Auyuittuq National Park (Baffin Island) and the Quttinirpaq National Park (Ellesmere Island) in cooperation with C. Tarnocai (Agriculture and Agri-Food Canada, Ottawa) and J. Gould (University of Alberta, Edmonton, Canada). In Finnish Lapland, research continues on soil ecological investigations in the treeline ecotone, in cooperation with F.-K. Holtmeier (University of Münster, Germany) and within the EU framework LAPBIAT. Research on interactions between soil and vegetation in West Greenland (Kangerlussuaq) was completed in 2002 (Ph.D. thesis by U. Ozols).

At the Department of Physical Geography, University of Regensburg, H. Strunk continues his research in the Ob region in western Siberia, together with L. Agafonov, Ural Branch of the Russian Academy of Sciences, Yekaterinburg. The topics of research are the reconstruction of the thermokarst history of the last 500 years (M. Krabisch) and the reconstruction of the corresponding summer temperatures (M. Staudinger). Both studies are based on dendrochronological analysis of living trees (*Pinus sibirica*). Initial results indicate that summer temperatures in western Siberia between 1610 and 1640 AD were about 4°C higher than today.

At the Institute of Physical Geography, Freiburg University, H. Gossmann and S. Vogt continue to host the project King George Island GIS (KGIS), SCAR Geospatial Information Group. The KGIS project provides a spatial database for King George Island, South Shetland Islands, Antarctica, with a focus on high-resolution data sets for the periglacial areas of the island.

At the Department of Physical Geography, University of Stuttgart, the field investigations on geomorphic processes in Nordenski Öldland at Svalbard (Ph.D. thesis by S. Sander) verify the potential link between climatic change and geomorphic features. As part of a DFG project, M. Boese and C. Klose (Berlin) are researching the postglacial and recent morphodynamics in the Nanhuta Mountains (Taiwan). A meteorological station was established at 3540 m asl.

Field work on a GIS-based, three dimensional ecological model and an environmental atlas of the Yakutsk region (East Siberia) was started by J. Venzke, Bremen, and a Ph.D. thesis by C. Borowy in cooperation with V. Makarov, Permafrost Institute. A. Beylich, Department of Earth Sciences, Uppsala University, continues geomorphological research in the subarctic and arctic periglacial environments of Iceland and Lapland. The German Research Foundation-funded project "Mass transfers, sediment budgets and relief development in periglacial geosystems" is carried out in cooperation with the Department of Earth Sciences, Uppsala University (E. Kolstrup, H. Seppä, L.B. Pedersen), the Botanical Institute of Göteborg University (U. Molau), the Natural Research Centre in Saudarkrokur, Iceland (Sæmundsson), Kevo Subarctic Research Institute, Finland (S. Neuvonen), and the Institute of Geography, University of Halle-Wittenberg, Germany (K.-H. Schmidt). A. Beylich is coordinating the interdisciplinary Network "Sedimentary Source-to-Sink-Fluxes in Cold Environments" (SEDIFLUX).

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## JAPAN

Having finished a four-year research activity of the Mountain Permafrost Research Group in the Association of Japanese Geographers, the members of the research group are extending their research areas from the Japanese mountains to the Asian mountains. Four projects are involved:

- Frontier Observational Research System for Global Change (M. Ishikawa, Y. Zhang, T. Kadota and A. Sugimoto) observes land-surface hydrological processes in the Khentei Mountains, northeastern Mongolia in collaboration with the Institute of Geography, MAS (N. Sharkhuu) and the Institute of Meteorology and Hydrology (G. Davaa). This research focuses on the hydro-thermal condition of frozen ground in the southern boundaries of Northeast Eurasian discontinuous permafrost zone. It includes comparative measurements of ground temperatures, moisture and land-surface energy balances both on permafrost and permafrost-free slopes.
- The collaborative project between the Institute of Low Temperature Science, Hokkaido University (leader: T. Sone) and Kamchatka Institute of Ecology and Nature Management (leader: V.P. Vetrova) continues

research on permafrost environments of central Kamchatka to investigate the relationship between physical environment and permafrost distribution.

- A joint research group of National Institute of Polar Research in Japan (K. Fukui and Y. Fujii) and the Altai State University (N. Mikhailov, O. Ostanin and D. Troshkin) carried out mountain permafrost research in South Chuyskiy Range, Russian Altai Mountains in August 2003. They identified many active rock glaciers and open system pingos in the range. The distribution of active periglacial rock glaciers suggests that the lower limit of discontinuous permafrost in South Chuyskiy Range is at 1700–1800 m asl.
- Research on permafrost hydrology in the source area of Yellow River, China began in 2002 by a joint group from the Geological Survey of Japan, University of Tsukuba and ETH Zurich. This is a part of a five-year project on groundwater circulation in the Yellow River Basin. The research involves: analysis of satellite images; field monitoring of climatic, hydrological and geomorphic conditions; geophysical soundings on permafrost; and simulation of future changes in permafrost and hydrological conditions. Installation of miniature loggers and seismic sounding were undertaken in August 2003 (N. Matsuoka, A. Ikeda, T. Sueyoshi, T. Ishii and Y. Uchida).

Field projects on periglacial geomorphology also progress outside Asia. T. Sone, J. Mori and K. Fukui joined the Argentine project “Cryology in Antarctic Peninsula Region” which is focused on ground temperature monitoring, periglacial processes in Seymour Island and James Ross Island, Antarctic Peninsula region. The project leader is J.A. Strelin, Instituto Antártico Argentino. Monitoring of periglacial processes continues in the Swiss Alps. A summary of the nine-year monitoring was presented during the 8<sup>th</sup> ICOP field excursion A3 in Upper Engadin and also during the main conference in Zurich (N. Matsuoka and A. Ikeda). The continuous measurements have highlighted interannual variations in periglacial mass movements; mainly a reflection of snow conditions.

A special issue of *Zeitschrift für Geomorphologie* (Supplement 130, 2003) entitled “Glaciation and Periglacial in Asian High Mountains” was published. This issue contains papers from a symposium at the “5<sup>th</sup> International Conference on Geomorphology” held in Tokyo in August 2001, and includes an overview of Asian permafrost and reports on regional permafrost from Japan, Kamchatka and Bhutan. Copies are available for 98 Euro from E. Schweizerbart'sche Verlagbuchhandlung, Stuttgart (mail@schweizerbart.de).

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## KAZAKHSTAN

Permafrost and periglacial research in Tien Shan continues both with borehole monitoring and research on periglacial processes. Within the discontinuous permafrost zone of the Zusalykezen Mountain Pass area (3300 m asl) the borehole temperature observations show significant variation of permafrost thickness within a short distance. These differences depend on topography, slope aspect, geology, snow cover and other microclimatic conditions. At a north-facing slope the permafrost thickness varies from 15 to 90 m within the distance of 250 to 300 m. On the west, east and south facing slopes there is no permafrost for the same altitudes and similar ground composition. The greatest differences in ground temperatures of 1.5 to 2.2°C were observed between north (−0.4°C) and south (1.8°C) slopes.

The long-term observation started in 1974 continues on the thermal regime of coarse block slopes in comparison with fine-grained ground. Specific heat transfer by convection inside the coarse debris occurs as a result of its high porosity. The mean annual temperature of coarse blocky materials is 2.5 to 4.0°C cooler than the MAAT. As a result, permafrost can exist inside such deposits even under a positive MAAT. Near the Big Almatian Lake (Transili Alatau Range) at an altitude of 2550 m asl (permafrost with isolated patches) with a MAAT of 1.4°C, the frost penetration is more than 6 m in the coarse block slope. Normally, at the same elevation in the fine-grained soils the seasonally frozen layer does not exceed 1.2 m. The large coarse blocky massifs have a cooling influence for distances of up to 15 m on adjacent sites with fine-grained soils.

The periglacial research includes measurements using geodetic survey on the development of thermal depressions on moraines and rock glaciers. A thermokarst lake began to form a few years ago on the surface of the rock glacier “Perevalny.” The rock glacier is located at the divide of Big Almatian and Chong-Kemin Valleys at the elevation of 3500 m asl. The thermokarst lake developed at the location of the ice-saturated moraine and the rock glacier (see photo). Aerial photos show that the lake did not exist in 1990. During the last decade the thermokarst lake has reached a diameter of 35 m.



*The thermokarst lake at the source of rock glacier “Perevalny.” (Photograph provided by Sergei Marchenko.)*

The book *Permafrost of Northern Tien Shan: Past, Present and Future* (106 p.), by S.S. Marchenko, was published with the support of Siberian Branch, Russian Academy of Sciences.

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## MONGOLIA

Permafrost mapping and monitoring within the framework of the Global Environmental Facility project at Lake Hovsgol National Park continued for the second year in the six valleys entering the eastern shore of the lake. Year-round recording and periodic measurements of ground temperatures in shallow boreholes and at ground level were obtained. In addition, there are three automatic recording weather stations in the project area. These observations are made in cooperation with Bernd Etzelmüller, Eva Heggam, and Vladimir Romanovsky, and with the overall direction of Clyde Goulden (see *Frozen Ground* No. 26, pp.47–48). To monitor dynamics of the active layer, permafrost thermal state, and some cryogenic processes (pingo, thermokarst and solifluction), N. Sharkhuu drilled eight additional 5–10 m deep boreholes in these six valleys during spring 2003.

Permafrost studies within the framework of the Joint Japanese and Mongolian FRONTIER project continued for a second year in the Nalaikh and Terelj areas located about 35 and 70 km east of Ulaanbaatar, respectively. M. Ishikawa and others monitored the dynamics of permafrost with ground temperature recordings in the Nalaikh borehole (30 m deep), in Terelj boreholes (7 and 10 m deep) and in more than ten shallow holes (1.5-m) located along a cross-valley transect. He also made monthly electric resistivity soundings at two sites where three automatic weather stations are located.

At present there are 17 CALM and 13 GTN-P active boreholes with permafrost in the Khangai, Hovsgol and Khentei mountain regions. The dynamics of cryogenic processes and seasonal frost are monitored at some sites. Following the recommendations of the International Symposium on Mountain and Arid Land permafrost (Ulaanbaatar, 2001), Sharkhuu started observations to observe changes in active layers and altitudinal surface temperatures in the Tsengel mountains, Altai region. These observations are important for mapping Central Asian permafrost. It is planned next year to install two CALM holes at two new mountain sites and to drill one 15-m deep borehole in the Tsagaannuur valley of the Altai mountain region. In addition, it is important to monitor dynamics of some periglacial processes, especially rock glaciers in the Altai mountains. The plan is to organise an international project to study permafrost conditions in the Altai mountains, where very little information on permafrost exists.

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## NETHERLANDS

The Vrije Universiteit in Amsterdam (Han Dolman), in collaboration with the Institute for Biological Problems of Cryolithozone of the Siberian Division of the Russian Academy of Sciences in Yakutsk, is performing studies on the carbon and water exchange of larch and tundra ecosystems on permafrost. Measurements are taken by means of micrometeorological techniques above a larch forest in Yakutsk and a tundra site in the Far North near Chokurdakh. The aim is to estimate the annual exchange rates and determine the sensitivity to environmental factors.

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## NORWAY

Investigations based at the University Centre in Svalbard (UNIS) in Longyearbyen (78N), covering a range of geomorphic activities initiated in 1999 continued throughout 2003. Several of the activities are described in greater detail on the UNIS homepage ([www.unis.no](http://www.unis.no); see Department of Geology).

Investigations on ice-wedge dynamics, loess accumulation and snow cover control on ground temperatures continued by Hanne H. Christiansen, in her present staff position as Physical Geographer, UNIS. Automatic cameras and miniature dataloggers register snow depth and distribution, air and ground temperatures and ground cracking events. Samples of ice-wedge ice are collected for oxygen isotope analysis. A precipitation-sampling program initiated by Ole Humlum in 1999 continued. This project relates the oxygen isotope signal to air temperature and thereby provides background for interpreting the oxygen isotope content in ice sampled from rock glaciers, ice wedges and glaciers in the Svalbard region.

Christiansen and Humlum maintain two CALM sites near Longyearbyen and Ny Ålesund. These sites represent dry and humid climatic settings; both are equipped with dataloggers to measure active layer temperatures. Seasonal snow depths and thaw progression are observed on the UNISCALM site located four kilometres from UNIS. Humlum continued measurements of precipitation and temperature at different sites in the landscapes around Longyearbyen. Two standard meteorological stations are operated in order to obtain information on the effect of altitude and the distance to the sea. One of the stations was established at the PACE Janssonhaugen borehole in May 2000. In addition, five automatic cameras are providing daily visual information on snow cover distribution and other geomorphic phenomena related to permafrost around Longyearbyen.

A research project on bedrock weathering in cold climate initiated in 2001 by Angélique Prick (UNIS/EU) located close to Longyearbyen, and involving detailed daily observations, was formally concluded in July 2003; future observations are planned at a reduced level.

Arne Instanes reports that the Svalbard Science Park is currently under construction in Longyearbyen. The new

building of 8500 m<sup>2</sup> will be completed in 2005 and provide additional space for the University Centre in Svalbard (UNIS), the Governor of Svalbard and Svalbard Museum. UNIS has in collaboration with Statsbygg (the Directorate of Public Construction and Property) and the Norwegian Geotechnical Institute (NGI) established an extensive permafrost monitoring and testing facility in connection with the Svalbard Science Park. Thermistor cables have been placed under the building and on the undisturbed surrounding tundra. Settlement of the piles and deformations in the building will be monitored, and a long-term pile load tests have been started. The data will be used for research and teaching at the UNIS department of Arctic Technology.

Mapping of late Weichselian/Younger Dryas wind activity in Norway was initiated by Christiansen. This project is a continuation of similar research in Denmark, Scotland and the Faroe Islands, and will provide information on direction of past air flow in Norway, as indicated by bedrock polished by drifting snow at low temperatures.

Eva Heggem and Bernd Etzelmüller, University of Oslo, continued investigating permafrost distribution in Mongolia, in collaboration with the Mongolian Academy of Science (Lake Hovsgol ILTER project). Data from mini-temperature loggers were obtained and processed, and an empirically-based permafrost distribution model is under development. Investigations continued in eastern Norway in the Sølen-Elgå mountain areas (E. Heggem). A new project on permafrost distribution on Iceland was started between B. Etzelmüller, O. Humlum, and H. Farbrot, Norway, and A. Gudmundsson and H. Björnsson, Reykjavik, Iceland. Temperature sensors were installed this summer in high-mountain field areas of northern and eastern Iceland and initial geophysical surveys were conducted. A geodetic network was established in Iceland for photogrammetric-based velocity measurements of creeping debris bodies (T. Eiken, B. Wangensteen). This work is carried out in collaboration with A. Kääh, University of Zurich. Within the same project framework measurements were started to determine permafrost distribution in the Lakselv area, northern Norway, by means of temperature loggers, BTS and geophysical investigations in collaboration with K. Isaksen.

Ketil Isaksen, Norwegian Meteorological Institute, reports on the continuing observations from the borehole network. In southern Norway, data collection continued from the Juvvasshøe PACE borehole (Isaksen) and on Dovrefjell from the 11 permafrost boreholes which were drilled in October 2001 (K. Isaksen, R.S. Ødegård, T. Eiken, J.L. Sollid). In the Møre and Romsdal area of western Norway, ground temperature data were collected and the permafrost mapping program was extended with establishment of six new meteorological stations measuring air temperatures and ground temperatures (K. Isaksen, L.H. Blikra, T. Eiken, J.L. Sollid). These ongoing data collection projects in southern Norway form the bases for a new project to study



*Drilling shallow boreholes for ground temperature monitoring in mountain permafrost in Møre and Romsdal, western Norway, September 2002. (Photograph provided by Ketil Isaksen.)*

changes in the ground thermal regime on a regional scale, and its effects on the mountain environment. In the Troms and Finnmark areas of northern Norway, ground temperature data were collected from several new sites established in 2002 and located in a transect from the outer rim of north-western Troms into Finnmarksvidda and out towards eastern Finnmark to Varangerhalvøya (K. Isaksen, L.H. Blikra, T. Eiken, J.L. Sollid). On Svalbard data from the Janssonhaugen PACE borehole were collected (K. Isaksen, R.S. Ødegård, O. Humlum, J.L. Sollid) and a new, 2-m deep borehole was drilled and instrumented approximately 100 m away from the deep PACE borehole to study active layer processes and snow cover influence on ground temperatures (S. Hanson, K. Isaksen).

A new research project on permafrost and periglacial processes is being planned by Humlum, University of Oslo. This project involves a number of study sites in a transect across southern Norway, from the humid west coast, across the high mountains in Jotunheimen and Dovrefjell, to the more continental regions close to the Swedish border. This research initiative is funded by the University of Oslo and will establish a network of automatic cameras and dataloggers to study air- and ground temperatures, snow cover and geomorphic processes. The activities will be new research sites and, where possible, they will cooperate with existing permafrost-related research sites. The thermal offsets obtained from temperatures recorded in standard 2-m screen temperatures, and at ground surface and the top of permafrost will be of special interest. A 3-year Ph.D. position is part of this project.

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## POLAND

During 2003 studies of geocosystems were carried out throughout the year at the permanent polar stations of the Polish Academy of Sciences, i.e. the Polish Polar Station in Hornsund (Spitsbergen, Svalbard) and the Polish H. Arctowski Station on King George Island (South Shetlands, Western Antarctic). During the summer the university stations situated on the west coast of Spitsbergen were operated.

The investigations are included in the "Arctic and Antarctic Research Programme of Poland 2002–2010" under the Committee on Polar Research, Polish Academy of Sciences. The objective is to evaluate mechanisms of natural processes occurring in the periglacial environments associated with glaciers and the coastal zone. The main interests focused on the response of polar geocosystems to changes of climate and the effect of human factors. Among the subjects concerning permafrost, the dynamics and thickness of the active layer are the most important. The studies were conducted at the Polish Polar Station in Hornsund, in the Kaffioyra area and in Billefjorden.

Results from the Recherche Fiord region by the M. Curie-Skłodowska University in Lublin were presented at the 8<sup>th</sup> ICOP. The hydrological dynamics and retention of water in a permafrost environment (S. Bartoszewski) and the spatial and temporal variations of active layer thickness (J. Repelewska-Pękalowa & K. Pękala) are associated with the CALM programme (Calypsostranda site).

The XXIX International Polar Symposium was held on September 19–20, 2003, at the Jagiellonian University, Cracow, which is one of the oldest universities in Europe in one of the oldest cities in Poland. This annual meeting of members of the Polar Club of the Polish Geographical Society provides the opportunity to present the latest research results, exchange experiences, and meet members of the polar community.

This year the Annual Geomorphological Workshops took place on Spitsbergen, organised by the Polish Geomorphologists Association in cooperation with the Maritime Academy in Gdynia and the Institute of Geophysics of the Polish Academy of Sciences. The Workshops' programme included discussions of geomorphological studies carried out by various Polish universities and visits to the stations at: Kaffioyra, Nicolaus Copernicus University, Toruń; Petuniabukta region, the Adam Mickiewicz University, Poznań; Calypsobyen, Maria Curie-Skłodowska University, Lublin; Stanisław Baranowski station in the forefield of Werenskiöld Glacier, Wrocław University and Silesia University; and Hornsund, the Polish Polar Station, Institute of Geophysics, Polish Academy of Sciences.

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## RUSSIA

Field investigations were conducted over the Russian permafrost territory including the Northeast, Yakutia,

northern West Siberia, Zabaikalye, Sakhalin, Primorye and the European North. They mostly involved surveys for large investment projects related to pipeline construction and mining operations. Geochemical and permafrost ecological research was undertaken on Yamal peninsula and along the lower reaches of Yenisei and Pechora rivers by the Production and Research Institute for Engineering Construction Survey, Permafrost Institute (SB RAS), Institute of the Earth Cryosphere (SB RAS), Moscow State University, and others.

Measurements of borehole temperatures, frost heaving, thermokarst settlements, thermoerosion, characteristics of groundwater regime, and meteorological parameters continued at permafrost stations. Continuous instrumental observations have been supported for more than 25 years at Vorkuta, Nadym, Marre-Sale and Yakutsk. The Permafrost Institute established a new permafrost station on the Selenga River delta for the study of seasonally and perennially frozen ground. The data will be used to develop the river-delta model as a natural biological filter for the Lake Baikal ecosystem.

The efforts of many researchers and organisations were concentrated on the Global Change problem. The University of Colorado and the Institute of Physical-Chemical and Biological Problems of Soil Science analyzed trends of the air and ground temperatures for the Russian territory from 242 meteorological stations. The permafrost response to the climate changes is essentially distinct in different regions. As a result of "MIRECO" programme it was revealed that from 1970 to 1995, the permafrost table was disconnected from the active layer bottom within vast areas of discontinuous permafrost zone. Many Russian geocryologists are inclined to consider contemporary warming as a phenomenon provoked mainly by natural causes rather than human impact (V.T. Balobayev, A.D. Douchkov, A.V. Pavlov, N.I. Shender, and N.A. Shpolyanskaya). There is agreement that the rapid degradation of continuous permafrost is exaggerated. Specialists of the Institute of the Earth Cryosphere negate the possibility of the degradation of continuous permafrost during next 50 years.

Russian permafrost specialists were engaged in joint investigations with colleagues from Canada (Department of Agriculture), Germany, Japan (Hokkaido University), Norway (Norwegian Geotechnical Institute), United States (University of Colorado) and others. During the past year Russian researchers participated in the following international and joint activities:

- The Circumpolar Active Layer Monitoring (CALM) programme.
- Arctic Coastal Dynamics, the Laptev Sea System, and the Dynamics of Laptev Sea Cryolithozone.
- Completion of the international programme "SPICE—Sustainable Development of Pechora Region" in close corporation with MIRECO (former Polar Ural Geology). A new project "Permafrost and Climate in Asia" was

proposed for consideration by international sponsors. It proposes to concentrate investigations on two transects across different types of the cryolithozone: Russia-China-Japan and Russia-Kazakhstan-China.

As in preceding years the studies of the offshore-onshore permafrost of the Russian Arctic were conducted principally together with German scientists. New knowledge was obtained on the following topics:

- The evolution of the offshore permafrost and gas hydrate stability zone on the shelf of Eastern Siberia during Pleistocene and Holocene (Hans-W. Hubberten, N.N. Romanovskii and others).
- The cryogenic morphology of Quaternary deposits and sea coast abrasion in the central part of Yamal peninsula coast (A.A. Vasiliev, M.Z. Kanevsky).
- The dynamics of the coastal zone adjacent to the Lena River delta, and the recession rate of the thermo-abrasive shores of the Laptev sea (F.E. Are and others).

In the course of regional, theoretical and experimental research, new results were obtained as follows:

- Scientists of the Department of Cryolithology and Glaciology (MSU) analyzed the main permafrost types according to the landscape structure and estimated the risk of cryogenic hazards in oil- and gas-producing areas.
- The famous 2002 Kolka Glacier catastrophe was examined and the intensity of contemporary thermokarst subsidence was estimated following glacier descent.
- L.S. Garagoulya (Department of Geocryology, MSU) confirmed the assumption that short-period climatic cycles most likely induce thermokarst subsidence under marine climate conditions.

Among important studies conducted in the Permafrost Institute were:

- Analysis of chemical composition of atmospheric gases and aerosols for sites with different conditions of climate and human influence.
- Detailed thermal and water balance observations were performed at the Upper Kolyma plateau during the last five years; thus establishing the main peculiarities of pore ice formation and melting in the coarse-grained slope deposits.
- Computer modelling demonstrated the dependence of the floodplain taliks size upon such natural factors as permeability, path distance gradient of the flow, temperature of river water and ground surface, and rate of lateral erosion.
- Based on drilling from the sea ice at sites 0.4–1.3 km from the shoreline, the top of the permafrost table was located at depths 2–17 m below the sea bottom. The rate of thawing of subsea permafrost is very high; up to 0.1 m/year.

A number of works were directed toward the development of permafrost mapping. The Production and Research Institute for Engineering Construction Survey developed a new mapping method using a matrix system

of permafrost conditions. On the basis of field research, a digital maps series was prepared for promising regions of oil and gas development. Several special maps were completed that allow the estimation of the risks of development on the Russian Arctic shoreline (M.M. Koreisha, F.M. Rivkin, and N.V. Ivanova). Map model systems were improved and digital maps with accompanying databases were drawn for the Norilsk industrial region and some oil and gas fields in the north of West Siberia (D.S. Drozdov, Institute of the Earth Cryosphere). The Department of Geography (MSU) prepared a series of cryo-ecological maps for the European North and Western Siberia.

Progress was achieved in the studies of physicochemical processes in frozen ground.

In the Department of Geology (MSU), new experimental data on the ice and gas-hydrates formation were obtained for the soils with various salinity. The speed of longitudinal waves as a function of lithology was determined on the frozen ground samples that contain gas hydrates (Cheverev, Chouvilin, Ershov, and Zykov). Thermal characteristics of the frozen soils were established based on the degree of contamination by petroleum products (Ershov, Motenko). Criteria were developed for determining the limits of the plasticity of frozen ground containing high salinity. New data were obtained on unfrozen water migration in a shear zone (Roman). The team from the Permafrost Institute's Chita laboratory studied the influence of freezing-thawing cycles on composition, structure and properties of gold-bearing deposits. Thermal properties of segregated ice were investigated under laboratory conditions (Grechishchev and others, Institute of Earth Cryosphere).

Research on the lithogenesis under permafrost conditions received further development in research of the Geography Department (MSU). The role of cryogenesis in the soil forming over the territory of modern and Pleistocene permafrost was investigated. New data were obtained on the isotope and chemical composition of surface and ground ice from the Polar Urals and Bolshezemelskaya tundra.

The Institute of Northern Mining Problems (SB RAS) developed the software for determination of the ice-cover thickness. The non-contact, georadar method was developed for measuring rates of about 20 km/h with an error not exceeding 3%. Successful tests were performed during high water on the Lena and Aldan rivers.

S.V. Alekseev (Institute of the Earth Crust, SB RAS) obtained new data on the permafrost of Yakut diamond province.

Experimental research established that in the early stage of induced polarization various types of frozen ground are characterised by either normal or abnormal values of apparent polarisation. As a result, the boundaries between different engineering geological elements during the geocryological survey in the Chita-Ingoda depression can be determined.

Important work was done on the problems of engineering geocryology.

Computer modelling was carried out on the temperature fields formed around cooling underground storage of radioactive wastes (Department of Geocrylogy, MSU). Creating artificial frozen barriers can prevent the migration of radionuclides under temperate climate conditions.

For the warm cryolithozone in the city of Chita recommendations were developed on stage-by-stage transfer of deformed buildings from pile foundations onto strip foundations without keeping the ground in the frozen state. This has helped to stop the buildings from subsiding (Chita's Laboratory of Permafrost Engineering). Department of Cryolithology and Glaciology (MSU) has drawn the map of activity of cryogenic processes in the urbanized territories at the scale 1:15,000,000. It is based upon permafrost zonation according to the type and strength properties of the ground as well as temperature conditions. Population and time of settlement are taken into account and the main cryogenic hazards are determined.

Research on planetary cryology continued. Estimates were made that 15% of the Mars surface is covered with permafrost (Mitrofanov, Institute of Space Research, RAS). At Moscow State University the new version of a geologic-structural map of Mars at the scale 1:50,000,000 was prepared and pilot calculations on the size of frost-crack polygons were made (Ershov, Komarov).

The International Conference on Earth Cryosphere as an Object for Nature Management was held in Pushchino, May 25–28, 2003. It was dedicated to the memory Academician P.I. Melnikov on the 95<sup>th</sup> anniversary of his birth. Scientists from Canada, Germany, Japan, Russia and several other countries took part. The following problems were considered: nature management in arctic and subarctic regions; heat and mass transfer in cryolithozone complexes, the extreme phenomena and natural hazards in cold regions; problems of cryosphere biology; medical and social aspects of habitation in the North; cryofacial analysis and cryo-indicators; physico-chemistry and geophysics of cryogenic phenomena; shelf and coastal permafrost in the Arctic. Lively discussions were induced by use of geocryological parameters (temperature at the top of permafrost horizons, the active layer thickness etc.) as the indicators of modern climate change (Anisimov, Kakunov, Malkova, Pavlov, Vasiljev). The discussions emphasised the need to develop additional research.

Russian permafrost scientists participated in 8<sup>th</sup> ICOP. Thanks to financial support from the Swiss organizing committee the Russian delegation was one of the most numerous with 43 participants including 10 students.

The World Conference on Climate Change took place in Moscow in September 29–October 3. Russian President Putin made the opening speech. He emphasized that Russia will subscribe to the Kyoto treaty based on the trustworthiness of scientific conclusions about global warming

and its consequences. Considerable attention at the conference was given to discussion of permafrost response to contemporary climate change.

The Department of Geography at MSU held a scientific seminar and meeting in June devoted to memory of A.I. Popov in connection with his 90<sup>th</sup> birthday.

Monographs have been prepared as follows:

*Geocryological Conditions Kharasavey and Kruzenshtern Gas Condensate Fields (Yamal peninsula)*, editor-in-chief Professor V.V. Baulin, was published.

*Ecogeology of the European North of Russia (Republic Komi, East Part of Nenets National Region)* by N.G. Oberman, I.G. Shesler and A.I. Rubtsov is accompanied by two ecogeological maps at scale 1:1,000,000 and geochemical catalogues.

*Prospects for Steady Development of the North: Habitation in Modern Conditions* by the Research Institute of Foundations and Underground Structures.

*Geocryological Glossary*, editors V.V. Baulin and V.E. Murzaeva, Research Institute for Engineering Site Investigations (PNISS) (geos@geo.tv.sign.ru).

A special issue of the journal *Earth Cryosphere* was produced in English for 8<sup>th</sup> ICOP. Preparation for editing an English version of the journal on a continuous basis is under consideration (see *Publications*, p.42)

At the end of May the Russian permafrost community celebrated the 50<sup>th</sup> anniversary of Geocryology Department, Moscow State University; one of the main centers for preparing specialists in permafrost science and engineering.

Finally, we would like to mention the 70<sup>th</sup> birthdays of two well-known scientists: Dr. V.R. Alekseev (Institute of Geography, SB RAS) and Dr. L.N. Khrustalyov (Moscow State University) who are cordially congratulated by their colleagues.

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## SPAIN

The VI Meeting of the IPA-Spain group took place from June 25–27, 2003, in La Granja de San Idelfonso (Segovia, Spain) at the base of the northern foothills of Peñalara Massif (Guadarrama Mountains of Spain's Central Range). Members of the Department of Geodynamics at Universidad Complutense de Madrid and the Department of Geological Engineering at Universidad de Castilla-La Mancha organised the meeting.

The general topic of the meeting was "periglacialism in relation to other topics," and the discussions highlighted the interaction between phenomena derived from freezing-thawing processes and factors typically associated with slope stability and vegetation colonization. The opening presentation given by the Director of Peñalara Natural Park reviewed the status of ecological restoration work being done in a high mountain area of the park. The area was once the site of a ski station and now the habitat is being

reclaimed to its natural dynamics. Two other park employees discussed the difficulties of regenerating the natural ecosystems in areas affected by numerous freeze–thaw cycles.

In the scientific sessions fifteen papers were presented that focused mainly on the Iberian mountains. They were grouped into three categories: monitoring and dynamic characterisation of cold-climate processes; ecology, paleoclimatology, and natural hazards in cold-climate areas; and morphogenesis derived from cold-climate processes.

Field work was conducted on Peñalara Massif (2428 m), the highest peak in the Guadarrama Mountains, to gain insight to current periglacial activity above 1900 m, to detect morphologic indications that reveal current activity, and to interpret data collected at local control stations.

The team leaders of the IPA-Spain group closed the meeting with the presentation of the results of a detailed survey sent to group members to determine priorities for the direction of research presented in scientific works up to the present, set priorities and propose future research. Members agreed to the proposal to coordinate work on permafrost monitoring and periglacial processes underway in several mountain ranges of the Iberian Peninsula (Pyrenees, Central Range and Sierra Nevada) and in the Antarctic, and to study the possibility of creating a network for the exchange of information among the different stations.

Discussions took place with Gonçalo Vieira to create a joint IPA Co-chaired Member (Iberia Member) between Spain and Portugal. This proposal was made to the IPA Executive Committee for Council consideration.

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## SWEDEN

Research activities included those at the Abisko Research Station, CALM-related observations, and other university projects dealing with permafrost and periglacial environments in the alpine, Arctic and Antarctica.

*Lund University:* The Department of Physical Geography and Ecosystems Analysis, has undergone a reorganisation and has merged with two research groups from the Department of Ecology. Together with geology, a new Geobiosphere Centre has been created that now occupies new departmental buildings.

In September 2003 a new CALM-grid monitoring programme was established by Torbjörn Johansson at the Stordalen mire (68°20'N, 19°02'E) in the vicinity of the Abisko Research Station (ARS), northern Sweden. The first measurements were obtained together with Jonas Åkerman. Basic parameters of soil and air temperatures, radiation, precipitation, water table position and soil moisture are monitored during the year at different sub-sites on the mire. In cooperation with the ARS, Åkerman continued the annual, long-term (1978 to present) observations at the 10 CALM sites along the 100-km east-west transect. By extending the existing long-term monitoring programme to the Stordalen

mire we now cover the mire in the region that has been most closely investigated since the IBP programme of the 1970s. Recent studies using aerial photography show large-scale changes during the last decades in the mires with underlying permafrost.

Due to financial limitations, the standard active-layer monitoring in the Kapp Linne area, Svalbard, started in 1972, were not obtained in 2003. Future cooperation with UNIS or other partners may result in the continuation of the programme. However, Åkerman is still maintaining a limited monitoring programme of active periglacial processes and their climatic significance in the Kapp Linne' area, Svalbard.

*Uppsala University:* Phil Wookey, Else Kolstrup and Göran Possnert continue a previously announced project on soil organic matter in high latitude soil. A project on the response of the forest-tundra ecotone to environmental change (DART: [www.durham.ac.uk/DART](http://www.durham.ac.uk/DART)) has so far resulted in a doctoral thesis by Sofie Sjögersten. Developing DART further, Wookey is Senior Visiting Scientist in a new U.K. NERC-funded project entitled "Snow in Tundra Ecosystems: Patterns, Processes and Scaling" (STEPPS, coordinated by Robert Baxter: <http://www.dur.ac.uk/stepps.project/>). Jan Boelhouwers has initiated a project on environmental controls on solifluction and frost heave processes in the Abisko area and continues his previously reported activities. A 2003 project headed by Else Kolstrup on boundary constraints of periglacial phenomena in Scandinavia has resulted in a doctoral thesis on palsas by Frieda Zuidhoff. Also, a "stone growth" project is being continued by Else Kolstrup, who also investigates relict periglacial phenomena. Visiting scientist Achim A. Beylich continues projects on sediment budgets in Iceland and Lapland (see German report, p.24).

*University of Karlstad:* Rolf Nyberg, Department of Earth Sciences, is conducting several projects in the Abisko area on the dynamics of the Kårsa glacier, permafrost and slope processes in the Pallenvagge and Nissunvagge valleys, and the assessment of the importance of extreme erosional events as geomorphological hazards and as climatic indicators.

*Stockholm University:* The Department of Physical Geography and Quaternary Geology announced the appointment of Peter Kuhry to the position of Professor in Physical Geography. Recruitment for a two-year post doctoral position within the field of Arctic Palaeoclimatology and/or Permafrost studies was also announced.

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## SWITZERLAND

The EVENT in 2003 was the preparation for the 8<sup>th</sup> International Conference on Permafrost in July. The main work load was carried out by the University of Zurich, the ETH Zurich and the SLF Davos, but all other Swiss institutes working on permafrost contributed as well.

The first pilot phase of the “**Permafrost Monitoring Switzerland (PERMOS)**” will come to an end this year. During the second pilot phase (2004–2005) the methodology of the BTS-area part of PERMOS will be improved.

The following activities are reported by several institutes:

- The Swiss Federal Institute for Snow and Avalanche Research (SLF) has started a new project to investigate the role of water in the active layer on steep scree slopes in alpine permafrost. Armin Rist is undertaking a Ph.D. in this context to obtain a better understanding of the interactions between water, ground temperature, and slope stability. Two boreholes were drilled in 2002 at Flüela Pass by Martina Lütschg who is monitoring and modelling the permafrost at the foot of a slope cooled by avalanche deposits. After being an editor of the 2003 ICOP proceedings, Marcia Phillips continues to monitor the performance of snow-supporting structures on steep avalanche slopes in creeping permafrost at three high altitude sites, and is involved in a project concerning a chairlift with stability problems. The SLF borehole programme now has a total of 12 boreholes at various sites in the eastern and western Swiss Alps in which ground temperatures and slope stability measurement are made—most of these are included in the PERMOS network.
- Permafrost monitoring on Schilthorn combined with geophysical and meteorological measurements has continued by Christian Hauck (Institute for Meteor-



*Unstable chairlift pylons in creeping permafrost terrain (Photograph courtesy of Marcia Phillips.)*

ology and Climate Research, University of Karlsruhe), Ingo Völksch (ETH Zurich), Lars Schudel and Martin Hoelzle (University of Zurich).

- At the Glaciology and Geomorphodynamics Group (University of Zurich), a number of permafrost activities are reported:
  - GIS-based modelling of rock glacier distribution in the Upper Engadin area is being performed by Regula Frauenfelder, Bernhard Schneider (University of Basel), Wilfried Haerberli and Martin Hoelzle;

- Energy flux processes in the active layer in the Corvatsch area are being investigated by Susanne Hanson, Monika Oswald and Martin Hoelzle;

- Rock wall temperatures and application of the surface energy balance model *Permebal* provide spatial surface temperature information. Hyperspectral and laser altimeter remote sensing data are used for the determination of accurate surface characterization such as albedo and surface roughness, which are used as input for the *Permebal* model (Stephan Gruber, Stephan Heiner, Daniel Schläpfer, Martin Hoelzle);
- Downscaling of climate model information for coupling with local energy balance models is being investigated in the Swiss Alps by Nadine Salzmann and Martin Hoelzle;

- Energy balance measurements and validation of the *Permebal* model in the Stockhorn-Zermatt area are performed by Nina Riesen, Stephan Gruber and Martin Hoelzle.

- On the two rock glaciers Muragl and Murtèl-Corvatsch temperature monitoring and borehole deformation measurements are ongoing within PERMOS. Based on the results of ETH-Mini-Poly project, laboratory experiments are being performed at the Institute for Geotechnical Engineering, ETH Zurich (Sarah Springman, Lukas Arenson).

- As for the past several years, at the Institutes of Geography of the Universities of Lausanne (Christophe Lambiel, Emmanuel Reynard) and Fribourg (Reynald Delaloye, Sébastien Métrailler) permafrost activities continue in close collaboration. The focus remains on the investigation of permafrost conditions on scree slopes, on the Little Ice Age forefields of small glaciers as well as on several rock glaciers, mainly in the western Swiss Alps. Some new sites are being investigated:

- On the Aget glacier forefield (Bagnes valley), frozen materials were moved by the Little Ice Age advance of the glacier. The frozen ground is now creeping/sliding backward due to the absence of the glacier (30 cm/a).
- In the Réchy/Lona region, the same electrical soundings and BTS measurements were carried out as in 1990 and compared (in collaboration with R. Lugon, University Institute Kurt Bösch, Sion).
- A 20-m deep borehole was drilled in the frozen lateral moraine of the Tortin glacier (Mont Fort; temperatures are between  $-0.5$  and  $-0.75^{\circ}\text{C}$ ).
- A steep valley side affected by slope and rock instabilities was investigated in the Arolla area. Many DC resistivity soundings and resistivity mapping lines were carried out on the different objects of the site (rock glaciers, scree slopes and glacier forefield).

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## UNITED KINGDOM

A conference entitled *Cryospheric Systems: Glaciers and Permafrost* was organised by the British Geomorphological Research Group and the Quaternary Research Association at Burlington House, the headquarters of the Geological Society of London, on January 13–14, 2003. The convenors were Charles Harris and Julian Murton. The meeting was attended by some 60 participants from Belgium, Canada, France, Germany, Iceland, Netherlands, Norway, Switzerland, the U.K., and the U.S.A. The aim of the conference was to explore the interactions between glacial and periglacial geocryological systems. An excellent series of papers was presented, generating a lively and stimulating discussion. A collection of papers presented at the conference is to be published as a Special Publication of the Geological Society of London and edited by Harris and Murton. The publication will include papers discussing a) glacier-permafrost interaction, b) the dynamics of the ice margin and the paraglacial zone, c) permafrost processes, d) cryogenic rock weathering, and e) periglacial slopes.

United Kingdom Nirex Ltd. have continued their involvement in an international project to characterise a continuous permafrost site in northern Canada, to better understand processes of subsurface water-rock interactions under cold climate conditions (as an analogue for conditions in the U.K. far into the future). The work is coordinated by the Geological Survey of Finland and participants include radioactive waste management agencies from Finland, Sweden, Canada and the U.K., as well as the University of Waterloo. The field study area is the Lupin gold mine in the Nunavut Territory. Permafrost extends to approximately 550 m depth. During 2002/03 investigations comprised:

- A wide-band electromagnetic survey (SAMPO). At Lupin sounding anomalies form a subhorizontal layer at depths between 400 and 700 m, in contrast to the vertical orientation of the geological units in the area.
- Drilling of boreholes (to 515 m) from adits in the mine to obtain groundwater samples and investigate hydraulically active fractures. The groundwater samples were analysed to investigate signs of freezing out processes that may cause fractionation of saline waters from fresher waters.
- Sampling of lake waters. The research area is characterised by a large number of smaller and larger lakes and ponds. Surface waters are being analysed to ascertain if there might be present discharge locally of deep groundwaters. This kind of situation might be experienced in a talik structure related to major fault structures, such as at Lupin.

In addition to the field studies, freeze-out experimental work has been carried out by Waterloo University. Key objectives of the study were:

- To measure changes in elemental compositions and

isotopic systematics related to the freezing of Canadian and Fennoscandian Shield groundwaters;

- To assess the importance of geochemical and isotopic signatures resulting from 'freezing out' on the recognition and interpretation of paleofluids; and
- To conduct a preliminary assessment of solute and mineralogical implications for flow system characterisation and evolution of shield groundwater composition.

The methods and results of Phase II of the Lupin study will be reported by the Geological Survey of Finland later in 2003.

A U.K. Natural Environment Research Council funded physical modelling experiment on bedrock fracture by ice segregation is being carried out in two cold rooms at the CNRS Centre de Géomorphologie, Caen, France, by Julian Murton, Jean-Claude Ozouf, Gerard Guillemet, and others. Crack development, rock surface heave, temperature and porewater pressure have been monitored in 10 blocks of chalk 45-cm-high during the course of more than 20 freeze-thaw cycles under conditions of simulated permafrost and seasonally frozen ground. As expected, the location cracking by ice segregation is strongly controlled by the thermal regime. In permafrost (2-sided freezing), cracking commenced at a depth determined by the permafrost table, with significant ice segregation occurring during thaw cycles. By contrast, in seasonally frozen rock (1-sided freezing), the location of cracking is more variable and closer to the rock surface.

A new research project at Cardiff University has been initiated in collaboration with the Welsh conservation body, the Countryside Council for Wales (CCW), concerned with the nature, distribution and mode of formation of relict ground ice features (ramparted depressions) in Wales. The associated Ph.D. programme by Neil Ross will be completed in 2005 and it is planned to include field investigations of modern active ground-ice features (open-system pingos) in Svalbard as part of the research programme.

The new U.K. representative on the IPA Council is Dr. Julian Murton of the University of Sussex. He replaces Charlie Harris who was elected as a Vice President at the Zurich conference. Julian has worked extensively in the Canadian Arctic, undertaken laboratory simulation experiments of cryogenic processes, and investigated Pleistocene periglacial stratigraphy in the U.K..

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## UNITED STATES OF AMERICA

Two oral sessions and one poster session on permafrost were presented at the Fall meeting of the American Geophysical Union in San Francisco the week of December 8, 2003. The U.S. Permafrost Association held its annual meeting at the AGU. Results of this year's election are

posted on the Association's web site ([www.uspermafrost.org](http://www.uspermafrost.org)). During the past year membership in the USPA increased to 170 individual, corporate and institutional members. U.S. participation in the 8<sup>th</sup> ICOP included 48 attendees, 40 papers published in the proceedings, and nine extended abstracts. The USPA was unanimously elected by the American Geological Institute's (AGI) Member Society Council as its 42nd Member Society ([www.agiweb.org](http://www.agiweb.org)).

A program focused upon the freshwater cycle of the Arctic Basin was funded by the U.S. National Science Foundation under the SEARCH program. Projects under this "Freshwater Initiative" address the goals of the Arctic-CHAMP program (<http://arcticchamp.sr.unh.edu/index.shtml>):

- Assess and better understand the stocks and fluxes within the arctic hydrologic cycle;
- Document natural variability in and changes to the arctic water cycle;
- Understand the sources of natural variability and causes of arctic water cycle change and assess their direct impacts on biological and biogeochemical systems; and
- Develop predictive simulations of the response of the earth system and human society to feedbacks arising from natural variability and progressive changes to the arctic hydrological cycle.

The American Society of Civil Engineers (ASCE) Technical Council on Cold Regions Engineering (TCCRE) met in Las Vegas in March. Dan Smith (University of Alberta) presented plans for the 12<sup>th</sup> International Conference on Cold Regions Engineering in Edmonton, Alberta, May 16–19, 2004. The 13<sup>th</sup> International Conference on Cold Regions Engineering is being planned for Bangor, Maine, in June or July 2006. About 10 members of TCCRE participated in the 8<sup>th</sup> ICOP. ASCE President Patricia Galloway is planning to visit Finland and Russia in June 2004. TCCRE is providing input on ASCE's involvement in cold regions engineering for a presentation to the Association of Finnish Civil Engineers during the visit. TCCRE members are contributing to the following conferences: Winter Cities in Anchorage (February 2004); EWRI World Water Congress (Anchorage, May 2005), ISCORD2004/Symposium, and the 13<sup>th</sup> International IAHR St. Petersburg Ice Symposium (June 2004). TCCRE committees continue to produce the *Journal of Cold Regions Engineering*, Cold Regions Monographs, and programs for sessions at ASCE national meetings.

The 135-acre, CRREL Farmer's Loop Road permafrost site, Fairbanks, Alaska was dedicated as one of the National Geotechnical Experimentation Sites (NGES) at a ribbon-cutting ceremony on September 23, 2003. The NGES Geo Council serves as a forum for exchanging ideas and information among geo-engineering associations and professions, construction organisations, and government



*Ribbon-cutting group (from left to right): James Wuebben, Joe Roberto, Rick Morrison, James Houston, Karen Henry, Jean Benoît, Peter Smeallie. (Photograph by Marie Darling).*

agencies. Engineering research has been conducted on the site since the late 1940s and included experimental permafrost foundations, the measurement of frost heave forces on piles, long-term influence of vegetation on permafrost stability, experimental road surfaces, insulation of roads and thawing of permafrost by passive solar means, and bioremediation. With the addition of the CRREL site the NGES Program now has seven sites available to the geo-community to advance the state-of-the-art in the areas of in-situ field testing, field instrumentation, prediction of soil behavior, and foundation prototype testing.

Tingjun Zhang and Roger G. Barry, National Snow and Ice Data Center (NSIDC), University of Colorado, report a number of current projects and activities:

- Historical soil temperature changes in the Russian Arctic and Subarctic;
- Inter-decadal variations of freeze and thaw depths in Russia;
- Response of river runoff to permafrost thawing in the Russian Arctic drainage basin;
- Numerical simulation of talik formation under thaw lakes and talik freeze-up following thaw lake drainage;
- Detecting near-surface soil freeze/thaw cycle using a frozen ground algorithm; and
- The Frozen Ground Data Center <http://nsidc.org/fgdc>

Larry Hinzman and Doug Kane, University of Alaska–Fairbanks, report that numerous studies related to permafrost hydrology have been initiated or continued at the University of Alaska–Fairbanks Water and Environmental Research Center. These include studies on the impacts of water removal from tundra ponds, assessing the changes in water resource use on the Seward Peninsula for the last century, and assessment of wildfire in tundra watersheds (<http://www.uaf.edu/water/projects>). Several WERC researchers are also involved in the Freshwater Initiative (see above item), as well as continuing hydrological studies and observations started in 1984 in the Kuparuk River watershed, Northern Alaska.

Ken Hinkel, University of Cincinnati and Frederick Nelson and Nikolai Shiklomanov, University of Delaware, report on several related activities. The first five-year phase of the Circumpolar Arctic Layer Monitoring (CALM) program was completed, and plans for the second, five-year phase were initiated. Summer 2003 observations continued at many of the 125 circumpolar sites in Northern Alaska. Average grid thaw depths were about the same as in 2002 and, in general, average thaw depths were 10-20 cm below peak averages experienced in 1998. Thickness of the organic layer was determined by Jim Bockheim, University of Wisconsin, on the seven Alaskan CALM grids. Soil temperature and drift thickness have been monitored since 1997 along the 3.2-km long and 4-m high snow fence. Ground subsidence beneath the drift crest appears to be ongoing, most of the vegetation is dead, and ponding has become more pronounced. In August, about 70 air and soil temperature loggers were serviced in and around Barrow; these are used to monitor the urban heat island (UHI) effect in the 150 km<sup>2</sup> study area. There is a direct correlation between the UHI magnitude and fossil fuel consumption. Anna Klene is completing her doctoral dissertation on the UHI project.

Wendy Eisner, Kenneth Hinkel, and Richard Beck, University of Cincinnati, and James Bockheim, University of Wisconsin, are investigating research on paleoenvironments, geomorphic processes, and carbon stocks of drained thaw-lake basins on the Alaskan Arctic Coastal Plain. In 2003, fieldwork included thaw-lake basins, sites not impacted by the thaw-lake cycle, and ancient backshore beach dune complex. Paleosol sequences were sampled to help elucidate the erosional/depositional history of the Atkasuk region. Interviews with Inupiat community elders offered invaluable observations on landscape and climate change, as well as accounts of their cultural traditions and personal history.

During 2003, the Permafrost Lab of the Geophysical Institute UAF continued observations of the active layer depth, moisture and temperature and the permafrost temperature dynamics at the numerous permafrost observatories within the Alaskan Arctic and Sub-Arctic. A new active layer/near-surface permafrost observatory was established on the Banks Island in the Canadian Arctic (under Walker's Biocomplexity project). The IARC-funded permafrost observatory at Barrow was equipped with additional snow depth sensors. Establishment of a new permafrost observatory in the Cooper River basin was initiated. This site is very interesting because the old (Late Pleistocene) permafrost is almost continuous at this relatively southern location. At the same time, the temperature of permafrost at this site is very close to the melting point of ice and is continuing to rise. Ph.D. dissertation "Permafrost Dynamics in 20<sup>th</sup> and 21<sup>st</sup> Centuries Along the East-Siberian and Alaskan Transects" by Tatiana Sazonova was completed.

Tom Osterkamp reported at the 8<sup>th</sup> ICOP that permafrost temperatures along a north-south transect from Prudhoe Bay to Gulkana have generally warmed since the late 1980s, initially in response to thicker snow covers and continues into 2003. The warming north of the Brooks Range (2 to 4 °C) is comparable in magnitude to the century long warming there. Thin discontinuous permafrost is thawing at the base at a rate of 0.04 m per year at one site.

Gary Clow, U. S. Geological Survey, completed logging the 21 NPRA deep borehole array, downloaded data loggers from the soil temperature, active-layer network, added soil moisture sensors to nearly all the stations, and installed three new stations (two in NPRA and one in ANWR) as its contribution to the Global Terrestrial network for permafrost (GTN-P).

Walter Oechel and Kristen Freeman, San Diego State University, continue measurements of mass (CO<sub>2</sub> and H<sub>2</sub>O) and energy fluxes at Barrow, Atkasuk, and Ivtok, Alaska. All three sites are validation sites of CO<sub>2</sub> flux for MODIS product over the Arctic region. A portable eddy covariance tower was deployed to measure mass and energy fluxes at three locations along a transect between Barrow and Atkasuk. Soil respiration using automatic soil respiration chambers and soil CO<sub>2</sub> concentration were measured at both the Barrow and Atkasuk sites.

Patrick J. Webber, Craig E. Tweedie, and Robert D. Hollister, Michigan State University, report on recent activities at the Arctic Ecology Laboratory at Michigan State University ([www.cevl.msu.edu/ael/](http://www.cevl.msu.edu/ael/)) that includes organization activities for CEON (see p. 41), continuation of ITEX research and vegetation mapping at Barrow, and an undergraduate trip in December 2003 to Patagonia and Antarctica on a new MSU study abroad field course.

Donald (Skip) Walker, University of Alaska, and a team including 19 scientists and students from the U.S. and Canada completed its second field season investigating the effects of climate on frost-boil ecosystems. The project, funded under the NSF Biocomplexity in the Environment (BE) initiative, has as its main objective to determine how the decreased activity of vegetation in colder climates affects frost heave processes, and the size and spacing of frost boils, across all five arctic bioclimate subzones. This summer three Canadian research sites were established at Green Cabin in Aulavik National Park, Banks Island, and Mould Bay, Prince Patrick Island. Key factors being studied are the role of cryoturbation in sequestering soil carbon, and how biogeochemical cycling of carbon and nitrogen is affected by cryoturbation.

Nicole Mölders and John E. Walsh, Geophysical Institute and the International Arctic Research Center, University Alaska-Fairbanks, are modeling the impact of permafrost and snow on the thermal and hydrologic regimes of the Arctic. The soil frost and snow modules of the hydrothermodynamic soil vegetation scheme (HTSVS) were implemented and tested within the offline version of the



Common Land Model (CLM) of the NCAR Community Climate System Model (CCSM). As the project evolves, we will address changes in permafrost and associated hydrologic impacts in the context of greenhouse-gas-induced climatic change.

Ron Sletten and Bernard Hallet, University of Washington, established two physical and chemical monitoring sites at Thule, Greenland. This project is part of the NSF-funded biocomplexity project on carbon and nutrient cycling led by Jeff Welker, Colorado State University and includes Josh Schimel, University of California–Santa Barbara. The UW group also conducted the final field season in the Dry Valleys, Antarctica, on a project investigating surface ages and turnover due to contraction cracks; data includes continuous records of contraction crack dynamics (hourly data) and soil temperature at varying depths up to 20 m over the past five years.

Torre Jorgenson and Erik Pullman ABR, Inc., and Yuri Shur, University of Alaska, completed their third field season in the eastern NPRA, northcentral Alaska, studying lake basin development, floodplain development, and ice-wedge degradation as part of environmental baseline studies funded by Conoco Phillips Alaska, Inc. The work focuses on quantifying ground ice, sediment, and carbon stratigraphy within geomorphic units across the landscape. Ken Karle, Hydrologic Mapping and Modeling, Inc., Yuri Shur, and Torre Jorgenson initiated a pilot-scale project to evaluate remote sensing techniques for monitoring permafrost changes in central Alaska for the National Park Service.

Ted Vinson, Oregon State University, continues to promote the use of probabilistic methods in cold regions engineering design, which now incorporates global climate change considerations. He is currently working on a Federal Highway Administration project to produce an interactive instructional CD (or DVD) on Geotechnical Considerations and Road Foundation Engineering Practice in Cold Regions.

Tom Douglas, Cold Regions Research and Engineering Laboratory, Mark Conrad and Katharine Woods, Lawrence Berkeley Laboratory and Shirish Patil, University of Alaska Fairbanks are investigating permafrost cores to better understand the stable isotopic regime of methane hydrates. The core samples are from the 425-m deep Hot Ice #1 borehole drilled by Anadarko Petroleum Corporation, Maurer Technology, and the U.S. Department of Energy during March and April of 2003. The borehole penetrated permafrost at about 380 m. Preliminary isotopic results show increasing inputs of CO<sub>2</sub> derived from hydrocarbons/hydrates with depth, and may yield insight into methane hydrate formation within the permafrost.

Hannele Zubeck, University of Alaska Anchorage, continues research on foundations in permafrost, and includes field testing on removable piles in support of Hot Ice #1—the arctic tundra platform that holds the drilling rig and operations for Anadarko Petroleum Corporation’s methane hydrate production.

Larry Bryne, Alaska Department of Natural Resources, and associates continue the investigation as to when the tundra is ‘sufficiently hard’ to allow off road travel for the purpose of seismic exploration, oil field development and maintenance in the North Slope oil fields around Prudhoe Bay. The criterion which DNR follows for opening the tundra is 6 inches of snow and 12 inches of ground frost. Over the past 30 years the exploration season has decreased by over 100 days because the tundra has been slower to harden in the winter. Last December, DNR allowed Conoco Phillips Alaska (CPA) to construct a mile section of ‘demonstration’ ice road to assess these techniques.

David Esch, with Geo Engineers Inc., Anchorage, is currently involved in the Alaska Department of Transportation study of life-cycle costs of the airports in the Yukon-Kuskokwim Delta region. This includes the analysis of present construction methods and providing recommendations for the most suitable and economical methods of constructing and maintaining airfield embankments on the discontinuous permafrost of the region, and which are underlain primarily by ice-rich organic silts, and lack suitable sources of gravels for the construction of embankments.

Vladimir Aizen, University of Idaho, and an international team recovered two, 175-m surface to bottom ice-cores from the Belukha Plateau at the Siberian Altai in August 2003. The cores may record a 2,000-year climatic and environmental record. A 21-m shallow snow/firn core was recovered from the Bomi glaciated area in southern Tibet in October 2003. Several automatic weather stations are located at 4800 and 5800 m asl.

H. Jesse Walker, Louisiana State University, reports that the Colville River delta information has a new URL: <http://louisdl.louislibraries.org>. The “Colville Delta” collection has 53 texts, 24 tables/graphs, 50 maps, 1145 photographs and 870 aerial photographs ranging in dates from 1947 to 1992. The materials can be searched under 894 subject titles.

Details of the above reports and additional reports of U.S. permafrost activities are posted on the USPA web site.

The report *Climate Change, Permafrost and Infrastructure* was published in 2003 and is available from the U.S. Arctic Research Commission ([www.arctic.gov](http://www.arctic.gov)).

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## OTHER NEWS

### PORTUGAL

Research on periglacial processes by G. Vieira (CEG—University of Lisbon) continues in the Serra da Estrela, Central Portugal. The installation of a meteorological station at the top of the mountain with monitoring of ground temperatures, radiation and energy fluxes is under preparation. C.

Mora (CEG–University of Lisbon) is studying the local climate of the same mountain, with special focus on monitoring of air temperatures at different topographic positions. Remote sensing data is being used to calculate the components of the radiation balance in winter and summer.

Geomorphological dynamics, and climate studies were presented at the IPA–Spain meeting in La Granja–San Ildefonso (Segovia) in June.

The collaboration between the Universities of Lisbon (G. Vieira) and of Alcalá de Henares (Spain–M. Ramos) that focus on the study of the active layer and permafrost on Livingston Island (Antarctic) continues and the drilling of new boreholes is planned. Results of this joint project were presented at 8<sup>th</sup> ICOP.

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## NEW ZEALAND

Ian Campbell, Megan Balks and Christine Eliot participated in the 8<sup>th</sup> ICOP. Megan Balks, Mauro Guglielmin (Italy) and Ron Paetzold (U.S.A.) presented a joint paper relating to the permafrost monitoring that is being undertaken in the Ross Sea Region of Antarctica. Christine Eliot presented a paper summarising her Ph.D., a study on rock weathering processes in Antarctica. Ian Campbell presented a summary of thermokarst landforms that occur in the transantarctic mountains of Antarctica. The New Zealand and Italian Antarctic programmes are collaborating to develop a coordinated monitoring programme within the Ross Sea Region.

The Landcare Research Antarctic research programme, led by Dr. Jackie Aislabie, has secured funding for a six-year programme relating to human impacts on soils and permafrost in the Ross Sea Region. In the 2003–04 Antarctic summer they plan to undertake work at Cape Hallett related to soil and permafrost characterization. Commencing in the 2004–05 summer, Megan Balks (University of Waikato) and Malcolm McLeod (Landcare Research) will lead a soil and permafrost mapping effort based in the Wright Valley. The proposed mapping project will include a number of graduate students and will contribute to the IPA Cryosol and Antarctic Permafrost Working Groups' soil and permafrost mapping initiatives.

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## NORTHERN EURASIAN EARTH SCIENCE PLANNING INITIATIVE

In the beginning of 2002, a new American-Russian programme to investigate physical, biological, ecological and socioeconomic processes in Northern Eurasia was launched at a workshop held February 20–22, 2002, in Moscow, Russia. The Northern Eurasian Earth Science Planning Initiative (NEESPI) programme is co-organised

by the National Aeronautical and Space Administration (NASA) and Russian Academy of Science (RAS). In October 2002, NEESPI was formally unveiled during the 12<sup>th</sup> US-Russian Earth Sciences Joint Working Group meeting in Moscow. Several additional scientific and organisational workshops followed. A workshop to develop a Science Plan took place in April 2003 in Suzdal, Russia. In September 2003, the first draft was presented to the NEESPI Science Plan Review Committee meeting in Yalta, Ukraine. The Science Plan was reviewed by a panel of experts from academic, governmental, and non-governmental agencies, who represented several disciplines including hydrology, biogeochemistry, land-cover change, climate modeling, and remote sensing. A formal document will be prepared by the summer of 2004.

The NEESPI mission states: "The Northern Eurasia Earth Science Partnership Initiative (NEESPI) will identify the critical science questions and establish an international programme of coordinated research on the state and dynamics of terrestrial ecosystems in northern Eurasia and their interactions with the Earth's climate system to enhance scientific knowledge and develop predictive capabilities to support informed decision-making and practical applications." For more information, visit the NEESPI web site at "http://neespi.gsfc.nasa.gov/

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## NORTHERN RESEARCH BASINS

In 1975, the National Committees of the International Hydrologic Program (IHP) for Canada, Denmark, Finland, Norway, Sweden, U.S.A., and the USSR established a working group on Northern Research Basins (NRB). The role of NRB was to foster research of river basins in northern latitudes dominated by snow, ice and frozen ground. In 1992 Iceland joined the group and Russia took over responsibilities of the former USSR. Thirteen productive symposia/workshops have been held since the first in Edefors, Sweden (1975). The 14<sup>th</sup> NRB International Symposium and Workshop was held in Kangerlussaq, Greenland and organized by Bent Hasholt (Chairman) Institute of Geography, University of Copenhagen and the Danish Organizing Committee. The general theme of the 14<sup>th</sup> NRB Symposium and Workshop was "The role of high latitudes in global water balance and element budgets." Papers and posters on stocks and fluxes of the pan-arctic water balance were presented as well as contributions on impacts of arctic hydrology changes on nutrients, biogeochemistry and ecosystem structure and function. Information on the meeting is available at <http://www.geogr.ku.dk/projects/nrb14/index.htm>. The 15<sup>th</sup> NRB symposia/workshop is scheduled for the last week in August 2005 in Luleå and Kvikkjikk, northern Sweden (Lars.Bengtsson@tvrl.lth.se)

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## CIRUM-ARCTIC ENVIRONMENTAL OBSERVATORIES NETWORK

A planning meeting of the terrestrial Circum-arctic Environmental Observatories Network (CEON) was convened at the Royal Swedish Academy of Sciences in Stockholm, Sweden in October 2003. CEON aims to promote measurement of standardized environmental observations and dissemination of these to Arctic researchers whilst encompassing and building on the strengths of existing arctic research stations and environmental observatory networks. Attendees represented all eight arctic nations, eleven of the 18 IASC-member countries, a range of established monitoring networks, field stations, indigenous people's organisations, and funding agencies as well as experts from the environmental modeling and remote sensing sciences. Discussion focused on the disciplinary scope and internal organisational structure of CEON and priorities for future development. These span construction of a website that will include a novel internet mapping, informational and analysis tool, dissemination of brochures advertising the CEON terms of reference, and preparation of funding proposals to sustain the development of CEON. A full report of the meeting will be provided at the new CEON website [www.ceoninfo.org](http://www.ceoninfo.org).

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## SCANNET

The third annual meeting of the Scandinavian–North European Network of Terrestrial Field Bases (SCANNET) was held mid-October 2003 at the Kevo Station in Finland. Main topics for this meeting were overview of work package results, strategies for the publication, distribution and presentation of SCANNET results, future new developments within the network and cooperation with other organisations, networks such as CEON and other research stations in the SCANNET area. SCANNET is a thematic network funded for the period 2001–2003 by the European Commissions Key Action on Global Change and Biodiversity. The network consists of nine field site leaders, research station managers and user groups around the North Atlantic area. Participation is from the Kevo Subarctic Research Institute in Finnish Lapland; the Kilpisjärvi Biological Station in northwest Finland; the Abisko Scientific Research Station in northernmost Sweden; the Centre for Ecology and Hydrology's Research Station at Banchory in Scotland; the Zackenberg Research Station in northeast Greenland; the Norwegian Polar Institute Field Base in Ny-Ålesund in Svalbard; the Norwegian Institute for Water Research with its site at Dovre in southern Norway; the Litla-Skard field base of the Icelandic Institute of Natural History in Iceland; and the Sornfelli Station of the Faroese Geological Survey in the Faroe Islands.

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## ARCTIC COASTAL DYNAMICS

Arctic Coastal Dynamics (ACD) is a joint project of the International Arctic Sciences Committee (IASC) and the IPA's Working Group on Coastal and Offshore Permafrost. Its overall objective is to improve our understanding of circum-Arctic coastal dynamics as a function of environmental forcing, coastal geology and cryology and morphodynamic behavior. Annual workshops were held in Woods Hole (1999), Potsdam (2000 and 2001), and Oslo (2002). Results and extended abstracts are published in the Alfred Wegener Institute's journal *Reports on Polar and Marine Research* (Volumes 413, 443).

The Fourth Annual Workshop of the ACD program was held in St. Petersburg, Russia, November 10–14, 2003. The workshop was hosted by VNIIOkeangeologia with major support from the IASC, including support for four non-Russian young investigators. Sixty participants from seven countries attended including about 35 Russians. The workshop comprised presentations and discussions according to the ACD Implementation Plan followed by a meeting of the ACD Steering Committee. Emphasis was on completion of the coastal segmentation and estimates of organic and sediment fluxes resulting from coastal erosion. An additional objective was to convene a working group for initial planning of an Arctic Coastal Biodiversity (ACB) research agenda. Workshop abstracts are available on the ACB web site.

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## CLIMATE AND CRYOSPHERE

The fourth meeting of the Arctic Science System Study (ACSYS)/Climate and Cryosphere (CliC) projects Scientific Steering Group (SSG) of the World Climate Research Programme (WCRP) took place November 15–18, 2003, at the Arctic and Antarctic Research Institute, St. Petersburg, Russia. Dr. Barry Goodison (Canada) chaired the meeting that followed the successful Final ACSYS Science Conference, attended by approximately 250 scientists from 19 countries.

The first day of the SSG meetings was devoted to a joint meeting of the SSG and the Russian National Committee for research on climate and cryosphere. The committee is co-chaired by Academician Vladimir Kotlyakov, Director of Institute of Geography, Russian Academy of Sciences, and Dr. Alexander Bedritsky, Head of the Russian Federation Federal Service for Hydrometeorology and Monitoring of the Environment. Russian scientists provided summaries of relevant CliC activities.

The SSG decided to further work along four project areas encompassing: 1) terrestrial cryosphere and hydro-meteorology of cold regions, 2) polar oceans (and seas with ice cover) and marine cryosphere, 3) glaciers, ice caps, sheets and their relation to sea-level rise, and 4) integrated interaction of the cryosphere with the rest of the global climate

system. CliC will lead WCRP activities associated with the International Polar Year 2007/08. It was decided to hold the first CliC Science Conference in China in the first half of the 2005.

Considerable attention was given to the strengthening links between CliC and the International Permafrost Association. As a follow-up to the Zurich IPA resolutions (p. 21), Dr. Jerry Brown presented areas of common interest to WCRP, CliC and IPA including among other topics

CliC Project Area 1 studies, the Global Carbon Project, the Global Climate Observing System (GTN-P), and data assimilation and analysis. A formal agreement between CliC and IPA was discussed.

This summary is based on a more detailed report prepared by Vladimir Ryabinin, WCRP. For more information on CliC see: <http://clic.npolar.no>.

Jerry Brown ([jerrybrown@igc.org](mailto:jerrybrown@igc.org))

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## PUBLICATIONS

**Permafrost—Proceedings of the 8th International Conference on Permafrost**, Zurich, Switzerland, 21–25 July 2003 (M. Phillips, S.M. Springman, and L.U. Arenson, eds.): 2003, 1380 pp., 2 volumes, ISBN: 90 5809 582 7. EUR 425.00 / \$467.50

The main topics reported in the 230 papers include the effects of climate change on permafrost, problems related to slope processes in mountain areas, the description of new permafrost detection techniques using remote sensing and geophysics, improving the performance of infrastructure and design in permafrost, the characteristics of subsea permafrost, hydrology and waste management, ecological and environmental aspects in permafrost, the interactions of frozen ground with its surroundings and even some investigations of permafrost features on Mars.

The Americas: Toll free: 1 800 535-9544; Fax: 1 800 864 7626; E-mail: [ash.orders@aidcvt.com](mailto:ash.orders@aidcvt.com) (for orders) and [ash.cs@aidcvt.com](mailto:ash.cs@aidcvt.com) (for customer service).

Other countries: Tel.: 31.10 4145822; Fax: 31.10 4135947; E-mail: [orders@swets.nl](mailto:orders@swets.nl).

The 194-page Extended Abstract volume may be purchased for \$14 postage paid from Dr. D. Brandova, Department of Geography University of Zurich, Winterthurerstrasse 190, 8057 Zurich, Switzerland: Tel: 411 635 51 84; Fax: 411 635 68 48 ([brandova@geo.unizh.ch](mailto:brandova@geo.unizh.ch)).

**Permafrost: Seventh International Conference, Proceedings** (A.G. Lewkowicz and M. Allard, eds.), Nordicana No. 57. Price for printed volumes \$140.95 CDN or \$105 US; and CD is \$15 CDN and \$12 US. Centre d'études Nordiques, Université Laval, Ste-Foy, Québec, Canada, G1K 7P4. Tel. 418-656-3340; fax: 418-656-2978; [cen@cen.ulaval.ca](mailto:cen@cen.ulaval.ca).

**Permafrost: Sixth International Conference, Proceedings**, July 5–9, 1993, Beijing, China, 2 volumes. \$200.00 plus postage via money order. For total cost by air or surface contact: Zhu Yuanlin, Cold and Arid Regions Environmental and Engineering Research Institute, CAS, Donggang West Road 260, Lanzhou, China; Tel: 86 931 884 1490; Fax: 86 931 888 5241; Email: [Zhuyl@ns.lzb.ac.cn](mailto:Zhuyl@ns.lzb.ac.cn).

**Karl Ernst von Baer (1842): Materials for the Study of the “Eternal Ground-Ice” in Siberia.** This book, in German, was published for the first time in 2001, and documents the origin of permafrost research. The price is 35 Euro including shipping, and can be ordered from [erki@zbi.ee](mailto:erki@zbi.ee) or [lorenz.king@geogr.uni-giessen.de](mailto:lorenz.king@geogr.uni-giessen.de).

**Earth's Cryosphere (Kriosfera Zemlii).** A Special Issue in English of the Russian journal on geocryology, published by the Russian Academy of Sciences, Siberian Branch, in collaboration with the Scott Polar Research Institute, Cambridge. 106 pages. 2003 ISSN 1560-7496; \$30.00.

Following the extensive collaboration between Russian scientists and Scott Polar Research Institute personnel over many years, it was decided to publish a trial issue of *Kriosfera Zemlii* in English. The English language edition is published on a non-profit basis as a scholarly venture.

Purchasing a copy of the trial issue ensures that you will be kept informed of progress of future translations. For more information about the translated journal contact: Isabella Warren, Managing Editor, Earth's Cryosphere, Scott Polar Research Institute, Lensfield Road, Cambridge CB2 1ER, U.K., Email: [imtw1@cam.ac.uk](mailto:imtw1@cam.ac.uk)

The annual subscription for the four issues per year in Russian is \$60 USD if ordered directly from the Editorial Board, EARTH CRYOSPHERE, Fersman street, 11, 2, 68 117312, Moscow, Russia, Fax: (095) 135-65-82, E-mail: [kriozem@online.ru](mailto:kriozem@online.ru) or for \$96 at: [info@periodicals.ru](mailto:info@periodicals.ru) ([www.periodicals.ru](http://www.periodicals.ru)).

**CAPS: Circumpolar Active-Layer Permafrost System, version 2.0.** M. Parsons and T. Zhang (eds.), Boulder, CO: National Snow and Ice Data Center/World Data Center for Glaciology, CD-ROM. Available upon request. Tel: 1 303 492 6199; Fax: 1 303 492 2468; email: [nsidc@nsidc.org](mailto:nsidc@nsidc.org).

CAPS Version 2.0 is an update of the original 1998 CD, and contains the second five-year compilation of permafrost and frozen ground-related data and information products. CAPS 2 was compiled under the direction of the IPA Standing Committee on Data Information and

Communication (SCDIC) by the National Snow and Ice Data Center (NSIDC) for presentation to the participants in the 8<sup>th</sup> ICOP. CAPS is a major component of the IPA's Global Geocryological Data (GGD) system, an internationally distributed system of linked data centers or nodes. NSIDC and the CAPS sponsor, the International Arctic Research Center (IARC), have developed the Frozen Ground Data Center (FGDC) as a central node in the GGD system.

CAPS contains data sets and information products and metadata records describing additional data sets available at other GGD nodes around the world. Also included are photographic libraries of research sites, specialized and cumulative bibliographies, and extensive documentation of the Global Terrestrial Network for Permafrost's (GTN-P) borehole and Circumpolar Active Layer Monitoring (CALM) programs, the Arctic Coastal Dynamics (ACD) program, and the Cryosol Working Group, and regional and hemispheric maps of permafrost, frozen ground, and soils. CAPS 2 expands the scope of CAPS by including data and information for seasonally frozen ground regions including *in situ* measurements, satellite remote sensing, and model outputs. Some of the data originally on CAPS 1 have been updated for CAPS 2. (<http://nsidc.org/data/g01175.html>).

### Cold Regions Bibliography Project

The American Geological Institute (AGI) is continuing the *Antarctic Bibliography* and the *Bibliography on Cold*


*Regions Science and Technology* as part of the Cold Regions Bibliography Project. These bibliographies provide coverage of Antarctic research and exploration and Cold Regions engineering and physical science information. Over 250,000 references to global literature published from 1951 to date are included in the two databases. More than 25,000 references relevant to permafrost and frozen ground are included. Photocopies of the Cold Regions documents can be ordered through the GeoRef Document Delivery Service.

AGI compiles the Cold Regions Bibliography based on sources provided by U.S. and overseas scientists, the Cold Regions Research and Engineering Laboratory (CRREL), the National Science Foundation (NSF), and libraries and polar and research institutions worldwide. Through a cooperative agreement with AGI, the Scott Polar Research Institute (SPRI) provides information on the Antarctic materials. The Cold Regions Bibliography databases are part of the Arctic and Antarctic Regions collection of databases produced and distributed by the National Information Services Corporation (NISC). Contact NISC at 410-243-0797, e-mail [sales@nisc.com](mailto:sales@nisc.com), <http://www.nisc.com>.

The databases are also available on an annual subscription basis at [www.coldregions.org](http://www.coldregions.org). Individual subscriptions: \$65 each or \$90 for both databases. Institutional subscriptions: \$175 each or \$295 for both databases. E-mail: [coldregions@agiweb.org](mailto:coldregions@agiweb.org).

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E-mail inquiries to [coldregions@agiweb.org](mailto:coldregions@agiweb.org) or call 1-703-379-2480 ext. 230.

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## Cold Regions Bibliography Project

# 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, particularly after 2004. Please send corrections and additions to (hanne@unis.no) and (jerrybrown@igc.org). Readers are referred to web sites or individual email contacts for more information. Additional meetings and information can be found on the IASC Survey of Arctic Meetings (SAM) web site (www.iasc.no).

## 2004

February 18–22, Winter Cities 2004, Anchorage, Alaska (www.wintercities2004.org)

March 11–13, 34<sup>th</sup> Annual Arctic Workshop, Boulder, Colorado, U.S.A (<http://instaar.colorado.edu/meetings/AW2004/>).

March 14–19, 100<sup>th</sup> Annual Meeting of the Association of the American Geographers, Philadelphia, Pennsylvania, U.S.A. (www.aag.org)

March 22–25, International Conference on Arctic Microbiology, Rovaniemi, Finland (haggbloom@aesop.rutgers.edu)

April 21–27, Arctic Science Summit Week, Reykjavik, Iceland (kristjank@rannis.is)

April 26–30, European Geosciences Union, Nice, France (www.copernicus.org/EGS/egsga/futurega.htm)

May 3–7, 12<sup>th</sup> International Boreal Forest Research Association Conference: Climate-disturbance interactions in boreal forest ecosystems, Fairbanks, Alaska, U.S.A. (ffadm@uaf.edu)

May 2004, EWRI World Water Congress, Anchorage, Alaska (steven.f.daly@erdc.usace.army.mil)

May 14, Canadian Geomorphology Research Group, Association Québécoise pour l'étude du Quaternaire, Québec City, Canada (alewkowi@uottawa.ca)

May 16–19, 12<sup>th</sup> International Cold Regions Specialty Conference, Edmonton, Alberta, Canada (dwsmith@civil.ualberta.ca) (www.iwcse.com)

May 17–21, Joint Assembly of AGU and CGU, Montreal, Canada (meetinginfo@agu.org)

May 22–29, International Conference on Problems of the Cryosphere of Oil and Gas Provinces: 60 Years Experience in the Tyumen Region, Tyumen, Russia (gilichin@issp.serpukhov.su) and PACE21 Meeting (sglch@cardiff.ac.uk)

May 24–28, XIII Glaciological Symposium: Shrinkage of Glaciers: Facts and Analysis. St. Petersburg, Russia (igras@igras.geonet.ru)

May 23–28, 14<sup>th</sup> International Offshore and Polar Engineering Conference & Exhibition, Toulon, France (www.isopec.org)

May 30–June 4, 4<sup>th</sup> International Conference on Contaminants in Freezing Ground, Fairbanks, Alaska, U.S.A. (ConferenceSecretariat@freezingground.org)

June 13<sup>th</sup> International IAHR St. Petersburg Ice Symposium, (jon.e.zufelt@erdc.usace.army.mil)

July 26–30, International Symposium on Ice-Water-Ice Processes Across the Phase Boundary, Portland State University, Portland, Oregon, U.S.A. (Int\_Glaciol\_Soc@compuserve.com)

July 26–28, SCAR Open Science Conference/COMNAP, Bremen, Germany (<http://www.scar28.org>)

August 3–5, International Conference on Soil Classification, Petrozavodsk, Russia (<http://biology.krc.karelia.ru/soil04/>) and WRB Trans-Ural Polar excursion, July 25–August 2 (<http://ib.komisc.ru/conf/wrb-tour/>)

August 15–20, 30<sup>th</sup> Congress of the International Geographical Union, Glasgow, Scotland (info@iguglasgow2004.org)

August 20–28, 32<sup>nd</sup> International Geological Congress, Florence, Italy (www.32igc.org/home.htm)

August 22–27, 10<sup>th</sup> International Symposium on Microbial Ecology – ISME (Microbial Planet: Subsurface to Space), Cancun, Mexico (www.kenes.com/isme)

August 23–27, International Symposium on Arctic Glaciology, Geilo, Norway (Int\_Glaciol\_Soc@compuserve.com)

September 5–7, Sixth International Symposium on Permafrost Engineering, Lanzhou, China (heping@ns.lzb.ac.cn)

September 6–10, PACE21 Field Workshop and Meeting, Longyearbyen, Svalbard (sglch@cardiff.ac.uk)

September 13–17, 7<sup>th</sup> International Symposium on Cold Regions Development (ISCORD 2004), Sapporo, Hokkaido, Japan (www.iscord2004.com)

September 14–16, Bridges of Science Between North America and the Russian Far East—Past, Present, and Future: An International Conference on the Arctic and North Pacific, Vladivostok, Russia (<http://arctic.aaas.org>)

September 21–24, ACIA International Scientific Symposium on Climate Change in the Arctic, Reykjavik, Iceland (bhameister@iarc.uaf.edu)

October 3–9, SCAR Delegate Meeting, Bremerhaven, Germany, ([www.scar28.org](http://www.scar28.org))

November, European Conference on Exo/Astrobiology ([www.esa.int/export/esaCP/index\\_Calendar.html](http://www.esa.int/export/esaCP/index_Calendar.html))

July 29–August 6, XVII INQUA Congress, Cairns,

December 13–17, American Geophysical Union Fall Meeting, San Francisco, California, U.S.A. ([meetinginfo@agu.org](mailto:meetinginfo@agu.org)); U.S. Permafrost Association Annual Meeting ([www.uspermafrost.org](http://www.uspermafrost.org))

## 2005

Date to be announced, International Symposium on High-elevation Glaciers and Climate Records, Lanzhou, China ([www.igsoc.org/symposia/](http://www.igsoc.org/symposia/))

First half 2005, First CLiC Conference, China (<http://clic.npolar.no>)

January 20–22, International Conference on Periglacial Geomorphology, Clermont-Ferrand, France ([setienne@seteun.net](mailto:setienne@seteun.net))

March, Second European Permafrost Conference (PACE21 Workshop and Meeting), Potsdam, Germany ([sglch@cardiff.ac.uk](mailto:sglch@cardiff.ac.uk))

April 25–29, European Geosciences Union, Nice, France ([www.copernicus.org/EGS/egsga/futurega.htm](http://www.copernicus.org/EGS/egsga/futurega.htm))

Spring, Ground Freezing and Frost Action in Soils, Quebec, Canada

May 2005, Pushchino, Russia ([gilichin@issp.serpukhov.su](mailto:gilichin@issp.serpukhov.su))

August, 4<sup>th</sup> International Cryopedology Conference, Apatity, Russia ([sergey.gor@mail.ru](mailto:sergey.gor@mail.ru))

August 25–31, Northern Research Basins, 15<sup>th</sup> International Symposium and Workshop, Luleå and Kvikkjikk, Sweden ([Lars.Bengtsson@tvrl.lth.se](mailto:Lars.Bengtsson@tvrl.lth.se))

September 7–11, Sixth International Conference Geomorphology, Zaragosa, Spain (<http://wzar.unizar.es/actos/SEG/>)

September, PACE21 Meeting, Cardiff, U.K. ([sglch@cardiff.ac.uk](mailto:sglch@cardiff.ac.uk))

October, Second International Conference on Arctic Research Planning (ICARP II), Copenhagen, Denmark ([www.iasc.no](http://www.iasc.no))

Annual European Conference on Exo/Astrobiology ([www.esa.int/export/esaCP/index\\_Calendar.html](http://www.esa.int/export/esaCP/index_Calendar.html))

December 5–9, American Geophysical Union Fall Meeting, San Francisco, California, U.S.A. ([meetinginfo@agu.org](mailto:meetinginfo@agu.org)); U.S. Permafrost Association annual meeting ([www.uspermafrost.org](http://www.uspermafrost.org))

## 2006

April, European Geosciences Union, Nice, France ([www.copernicus.org/EGS/egsga/futurega.htm](http://www.copernicus.org/EGS/egsga/futurega.htm))

May, Pushchino, Russia ([gilichin@issp.serpukhov.su](mailto:gilichin@issp.serpukhov.su))

June, 13<sup>th</sup> International Conference on Cold Regions, Bangor, Maine, U.S.A.

July 9–15, 18<sup>th</sup> World Congress of Soil Science (WCSS), Philadelphia, PA, ([www.iuss.org/](http://www.iuss.org/))

Summer, Regional International Permafrost Conference and Field Excursion to Qinghai-Tibet Railroad, ([zhuyi@ns.lzb.ac.cn](mailto:zhuyi@ns.lzb.ac.cn))

December 11–15, American Geophysical Union Fall Meeting, San Francisco, California ([meetinginfo@agu.org](mailto:meetinginfo@agu.org)); (U.S. Permafrost Association annual meeting and planning for 8<sup>th</sup> ICOP)

## 2007

April, European Geosciences Union, Nice, France ([www.copernicus.org/EGS/egsga/futurega.htm](http://www.copernicus.org/EGS/egsga/futurega.htm)).

May, Pushchino, Russia ([gilichin@issp.serpukhov.su](mailto:gilichin@issp.serpukhov.su))

July, 24<sup>th</sup> IUGG General Assembly, Perugia, Italy ([www.iugg.org/](http://www.iugg.org/))

July 29–August 6, XVII INQUA Congress, Cairns, Australia. ([johnd@geog.uwa.edu.au](mailto:johnd@geog.uwa.edu.au))

Annual European Conference on Exo/Astrobiology ([www.esa.int/export/esaCP/index\\_Calendar.html](http://www.esa.int/export/esaCP/index_Calendar.html))

December 10–14, American Geophysical Union Fall Meeting, San Francisco, California, U.S.A. ([meetinginfo@agu.org](mailto:meetinginfo@agu.org)); U.S. Permafrost Association annual meeting ([www.uspermafrost.org](http://www.uspermafrost.org))

## 2008 (through summer)

April, European Geosciences Union, Nice, France ([www.copernicus.org/EGS/egsga/futurega.htm](http://www.copernicus.org/EGS/egsga/futurega.htm))

May, Pushchino, Russia ([gilichin@issp.serpukhov.su](mailto:gilichin@issp.serpukhov.su))

Late June/early July, 9<sup>th</sup> International Conference on Permafrost, Fairbanks, Alaska, U.S.A. ([www.uspermafrost.org](http://www.uspermafrost.org))

August 15–20, 2008, 31<sup>st</sup> Congress of the International Geographical Union, ([rabler@aag.org](mailto:rabler@aag.org))

August 20–28, 33<sup>rd</sup> International Geological Congress, ([iugs.secretariat@ngu.no](mailto:iugs.secretariat@ngu.no))



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DECEMBER 2003

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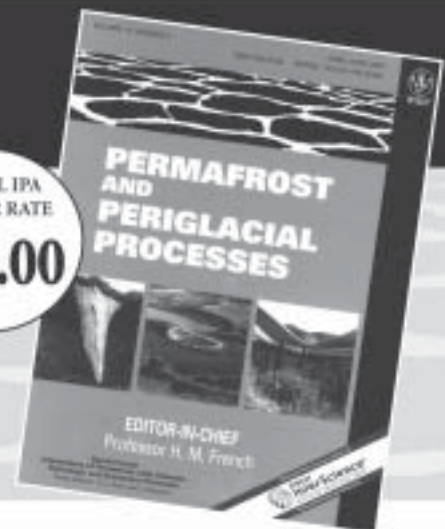
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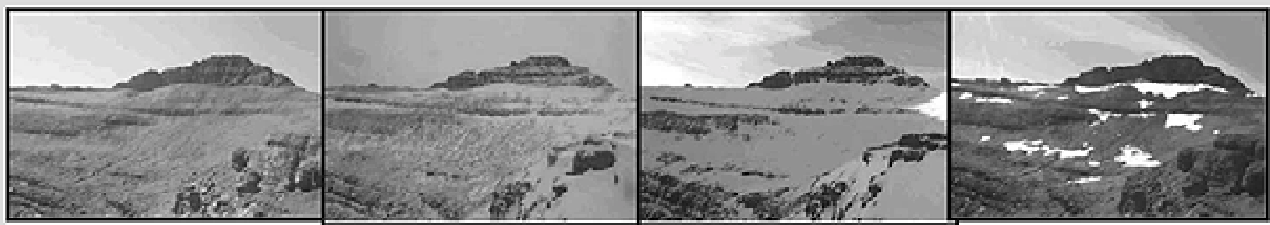
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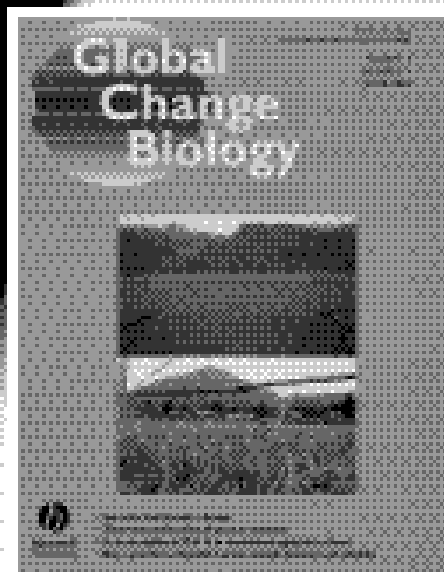
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