



# *Frozen Ground*

Number 16

The News Bulletin of the International Permafrost Association

December 1994



## International Permafrost Association

The International Permafrost Association, founded in 1983, has as its objectives fostering the dissemination of knowledge concerning permafrost and promoting cooperation persons and national or international organizations engaged in scientific investigations and engineering work on permafrost. Membership is through adhering national or multi-national organizations or as individuals in countries where no adhering body exists. The IPA is governed by its officers and a Council consisting of representatives from 20 adhering bodies having interests in some aspects of theoretical, basic and applied frozen ground research (including permafrost, seasonal frost, artificial freezing and periglacial phenomena). Working groups organize and coordinate research activities. The IPA became an Affiliated Organization of the International Union of Geological Sciences in July 1989. The Association's primary responsibility is the convening of the international permafrost conferences. The first conference was held in West Lafayette, Indiana, USA, in 1963; the second in Yakutsk, Siberia, 1973; the third in Edmonton, Canada, 1978; the fourth in Fairbanks, Alaska, 1983; the fifth in Trondheim, Norway, 1988; the sixth in Beijing, China, 1993. The seventh is planned for Yellowknife, Canada, in 1998. Field excursions are an integral part of each Conference, and are organized by the host country.

### Officers of the Association (Executive Committee)

<b>President</b> Cheng Guodong, China	<b>Vice President</b> Hugh M. French, Canada	<b>Vice President</b> Nikolai N. Romanovskii, Russia	<b>Secretary General</b> Jerry Brown, USA
------------------------------------------	-------------------------------------------------	---------------------------------------------------------	----------------------------------------------

### Council Members

Argentina	Finland	Netherlands	Spain
Belgium	France	Norway	Sweden
Canada	Germany	Poland	Switzerland
China	Italy	Russia	United Kingdom
Denmark	Japan	Southern Africa	United States of America

### Standing Committees

Finance Committee	Advisory Committee on Working Groups	Editorial Committee
-------------------	--------------------------------------	---------------------

### Working Groups

Data and Information	Periglacial Processes and Environments
Terminology	Cryosols
Global Change and Permafrost	Foundations
Mountain Permafrost	Seasonal Freezing and Thawing of Permafrost Areas

**Cover:** *Low-altitude aerial view of sorted circles from an area south of Ny Ålesund, western Spitsbergen. The two parallel stripes painted on the ground are about 2 metres apart. The location is the site of long-term research by Bernard Hallet, University of Washington. (Photograph by Johan L. Sollid, University of Oslo.)*

**FROZEN GROUND**  
**The News Bulletin of the**  
**International Permafrost Association**

**Number 16**

**December 1994**

<b>Executive Committee Report</b>	<b>2</b>
<b>Obituary</b>	<b>3</b>
<b>Reports of Working Groups</b>	<b>4</b>
Data and Information • Terminology • Global Change and Permafrost • Mountain Permafrost Periglacial Processes and Environments • Cryosols • Foundations Seasonal Freezing and Thawing of Permafrost Areas	
<b>News from Members</b>	<b>12</b>
Canada • China • Denmark • France • Germany • Italy • Japan • The Netherlands • Norway • Poland Russia • Southern Africa • Spain • Sweden • Switzerland • United States	
<b>Other News</b>	<b>23</b>
International Commission on Snow and Ice • World Glacier Monitoring Service 15th Polar Libraries Colloquy • Second ICAM • IGCP Project 385 • IGCP Project 253 International Arctic Science Committee • IUGS COGEOENVIRONMENT Workshop International Geographical Union • CLIMEX • Kazakhstan	
<b>Publications</b>	<b>27</b>
<b>Forthcoming Meetings</b>	<b>29</b>
<b>IPA Addresses</b>	<b>31</b>

*Frozen Ground*, the News Bulletin of the International Permafrost Association (IPA), is published semi-annually. The IPA is a non-governmental association of national organizations representing 20 countries or groups of countries. The success of the bulletin is dependent upon the willingness of IPA participants to supply information for publication. Copy date for issue No. 17 is 15 April 1995. Please ensure that working group and member country reports are submitted in good time for publication. News items are also very welcome from any IPA participant or others, as are interesting photographs for the cover (please furnish 8"×10" black and white glossy prints). To submit news items or photos please contact the appropriate individual listed on page 31, or the Secretary General.

Issue No. 16 of *Frozen Ground* was compiled by Jerry Brown with the assistance of Alan Heginbottom of the Editorial Committee. Production is courtesy of the Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, USA. Copies of *Frozen Ground* are available in Canada from Alan Heginbottom, Geological Survey of Canada, 601 Booth Street, Ottawa K18 0E8, Canada; in Russia from Nikolai Grave, National Permafrost Committee, USSR Academy of Sciences, Fersman Street 11, 117312 Moscow; in the United States from Jerry Brown, P.O. Box 9200, Arlington, Virginia 22219-0200; and elsewhere from Council members.

## EXECUTIVE COMMITTEE REPORT

It is our sad duty to report to you the deaths of several permafrost colleagues. We received news in July that Academician Melnikov had died; a detailed obituary of the IPA's first President appears on the next page. We have also learned of the deaths of three other Russian permafrost specialists known to many of us: Lev Pavlinovich Semenov; Boris Aleksandrovich Saveliev, Moscow State University; and Aleksey Georgievich Sukhov, PNIIS. More recently, Kaye R. Everett of The Ohio State University died of cancer. Our condolences are extended to the families and friends of these colleagues.

Several IPA working groups and the Executive Committee have met since we reported to you in June. Other working groups continued activities through correspondence, which now includes extensive use of electronic mail. Many other activities also took place and are reported by member countries; especially newsworthy is a report received from Spain—our newest member. Some highlights and details follow.

Two working groups met in conjunction with field excursions. The Cryosols WG conducted a 15-day excursion to the lower Kolyma region in Siberia with representatives from six countries present. The Periglacial Processes and Environments WG met in France as part of the joint IPA/IGU symposium on periglacial slope processes. The Data and Information WG met twice, in Southampton, UK, and at a workshop in Oslo, Norway. The latter was attended by representatives of seven IPA member countries and resulted in recommendations and plans for implementing the Global Geocryological Database (GGD). The Global Change and Permafrost WG met in San Francisco in early December in conjunction with a special AGU session on frozen ground and changing climate.

The Mountain Permafrost WG is preparing an inventory of current research on mountain permafrost by circulating a detailed questionnaire. The Terminology WG completed the eight-language glossary of permafrost and ground ice terms and will pre-publish the 350-page document under IPA sponsorship. Mem-

bers of the Foundations WG met informally to review and plan future activities.

The Editorial Committee is developing plans for an exhibit at the 1995 INQUA Congress. The IPA permafrost map underwent one more revision, and plans were completed for publication in 1995. Three of the authors (Brown, Melnikov and Heginbottom) met in Arendal, Norway, at the UNEP/GRID office, and provisional plans were developed to digitize the map under the auspices of GRID-Arendal.

The four members of the Executive Committee met in Southampton and Arundel, UK, on 2–3 July, following the Data and Information WG meeting. The Southampton meeting was attended by several participants from the UK (Mike Clark, Charles Harris, Peter Worsley), Canada (Alan Heginbottom) and Sweden (Jonas Åkerman). President Cheng reported on his recent visit to Mongolia and their interest in joining IPA. We discussed the need for working groups to have

specific projects. Plans for the next Berlin Council meeting were discussed and we agreed that a session will be organized by VP French on late Cenozoic ground ice stratigraphy. A provisional plan was developed to offer a modestly priced individual subscription to *Permafrost and Periglacial Processes*. Following the meetings in the UK, VP Romanovskii attended the Geoenvironment Indicators workshop in Newfoundland, Canada, and presented results of Russian slope and groundwater/surface icing observations.

This year 13 members paid their annual fees, for a total of \$6500 US. That amount, added to funds received in previous years, allowed us to allocate \$14,000 for activities of the working groups and Executive Committee. We will start 1995 with a balance of about \$10,000 and expect income from member fees to reach \$10,000. This will enable us to continue supporting working group activities and to convene the next Council meeting in August 1995. In addition to members' contributions, the U.S. National Science Foundation awarded a five-year grant to support the activities of the IPA Secretariat.



*Members of Executive Committee meet in Arundel, U.K. Left to right: Hugh French, Cheng Guodong, Nikolai Romanovskii and Jerry Brown.*

## OBITUARY

### **Pavel Ivanovich Melnikov, 1908–1994**

On 21 July 1994, at the age of 86, Academician Pavel Ivanovich Melnikov died of a heart attack in Moscow. He was born 19 June 1908 in St. Petersburg. Upon graduating from Leningrad College of Mines in 1935 he was appointed chief of the permafrost research station in the city of Igarka (Zapolyary) on the recommendation of geologists A.P. Karpinsky and V.A. Obruchev, under whose leadership he had been studying and working. From that time on, his creative life was devoted completely to study of the Far North, where he worked and lived under often harsh natural conditions for 55 years. During that time, he co-authored and edited more than 150 scientific papers, books, and monographs on the fundamentals of geocryology, hydrogeology, and engineering geology. Among his many scientific and engineering accomplishments was solution of the problem of water supply in Central Yakutia using subpermafrost groundwater in this region of thick permafrost. He also worked out new criteria and standards for the bearing capacity of frozen ground, thus broadening the possibilities for construction in the North.

In 1961 the Permafrost Institute in Yakutsk was created and Academician Melnikov became its director. The institute was soon recognized as the world leader in the study of permafrost. Leading specialists were attracted to it from throughout the Soviet Union. The institute built an elaborate underground system of laboratories in the permafrost and maintained a network of experimental field stations.

Academician Melnikov held many official positions in the Soviet Union. He was elected Corresponding Member of the Soviet Academy of Sciences in 1968 and became Academician in 1981. He chaired the Academy's Scientific Council on Earth Cryology and several other national permafrost committees. He possessed an enviable capacity for work, and remained involved in professional activities to the very end of his life, including, quite recently, the feasibility study for a tunnel beneath the Bering Strait.

Academician Melnikov became known to the interna-

tional community in the 1960s as he and the Permafrost Institute began hosting foreign scientists and engineers in Yakutsk and representing the Soviet Union at conferences in the West. His first major international success was the hosting of a field excursion of the IGU Periglacial Commission in Yakutia in 1969. He and his colleagues led the first group of foreign scientists down the Lena River and up the Aldan River to examine the massive ice wedge exposures and sediments. This trip was the first major contact under field conditions between foreign and Russian permafrost and periglacial scientists. It represented the opening of Siberia to the western world, a feat largely accomplished through Melnikov's perseverance, which overcame the inevitable multitude of bureaucratic and logistical obstacles.



The excursion was also a "practice run" for the Second International Conference on Permafrost that was held in Yakutsk in July 1973. At that conference, Academician Melnikov introduced the idea of forming an international permafrost organization. The idea was further developed at the Third Conference in Edmonton, and the International Permafrost Association was formally organized in Fairbanks in 1983 at the Fourth Conference. In recognition of his pioneering scientific and administrative accomplishments, Academician Melnikov was elected the IPA's first president, a position he held until 1988.

In 1989, Academician Melnikov became a member of the United Nations Intergovernmental Panel on Climate Change (IPCC) to assess the effect of the cryosphere, including permafrost, on global climate. As part of his IPA activities, he organized the International Symposium on Arctic Permafrost and Climate Changes in Norilsk, West Siberia. As one of his last initiatives, he recommended the organization of a special conference on geocryology and global change at the annual meeting of the Scientific Council of Earth Cryology to be held in April 1995 in Pushchino.

The permafrost community has lost a pioneer and a great supporter. The IPA offers its condolences to Pavel Ivanovich Melnikov's son and daughters: Vladimir, Tatiana and Ludmila.

## REPORTS OF WORKING GROUPS

### Recent Activities of the Working Groups

As indicated in the Executive Committee Report (p. 2), the working groups have been extremely active during the past six months or so. To continue these activities, and embark on new ones, working group proposals for 1995 have been requested. We also remind interested individuals who wish to become corresponding members of WGs to contact the appropriate Chair or Secretary (see p. 32 for addresses).

### Data and Information

R.G. Barry, Chair (USA)

J.A. Heginbottom, Secretary (Canada)

At its ninth Council meeting in Beijing, China, on 8 July 1993, the IPA adopted a resolution on "Global Change and Permafrost" (see *Frozen Ground* No. 14, p. 8, for details). In support of this resolution, the Executive Committee and the Working Group on Data and Information have been collaborating over the last year to develop and launch the Global Geocryological Database. Through the GGD, the IPA plans to facilitate the identification, acquisition and dissemination of permafrost and frozen ground data for research and practical applications. A subsidiary objective is to rescue and preserve for future use data sets that are at risk of being lost, for whatever reason.

Over the winter of 1993–94, a draft prospectus for a GGD was prepared and circulated for comment. A two-day workshop at the GeoData Institute at Southampton University, UK, on 30 June–1 July resulted in a final prospectus and initiation of several pilot projects. The Executive Committee, at its 2–3 July meeting, endorsed the project and the proposed course of action. This was followed by a working group workshop at the Norwegian Geotechnical Institute in Oslo, Norway, on 3–5 November to establish priorities for data recovery; develop an implementation plan and procedures for data recovery, storage and dissemination; and review the results of pilot projects underway in Russia and the UK. All IPA working groups and member countries were invited to participate in the November workshop; in the end, 19 people attended, representing the Data and Information WG, three other WGs (Global Change and Permafrost, Mountain Permafrost, and Foundations), the Executive Com-



*Participants in Oslo GGD workshop, November 1994: Top row (l to r): Douglas Posson, Wilfried Haerberli, Alan Heginbottom. Third row: Evgeny Melnikov, Odd Gregersen, Fritz Nelson, Roger Barry. Second row: Mike Clark, Chen Xianzhang, Rostislav Kanensky, Jerry Brown. Front row: Masami Fukuda, Julia Branson, Marina Leibman, Nikolai Romanovskii. Not in photograph: Kaare Flaate, Arne Instanes, Johan Sollid.*

mittee, and eight member countries (see photo). The Oslo workshop was sponsored in part by IPA and in part by several U.S. grants (NOAA and NSF) to the University of Colorado, under the direction of the working group chairman, Roger Barry. A brochure describing the GGD has been prepared and will be distributed to all recipients of *Frozen Ground* and other groups involved in data activities. The following summarizes current information on the GGD.

#### Objectives of the GGD Project

The specific objectives of the GGD project are as follows.

- To advance the scientific understanding of permafrost, with specific reference to relationships among climate, process, material and morphology; definition of paleo-permafrost conditions; and specification of future long-term environmental monitoring programs.
- To improve the basis of engineering design in the cold regions, for both contemporary and predictive purposes.
- To aid in understanding and predicting global and regional climatic change, and specifically to support the verification of global circulation models and trace gas cycles.

- To offer a basis for detecting environmental change at a range of temporal and spatial scales, particularly through establishing and managing long-term, wide-area monitoring programs.
- To enhance the basis for developing environmental scenarios and assessing environmental impact, including pollution and the socio-economic implications of environmental change in cold regions, for planning and environmental protection.

As currently proposed, the GGD will consist of an internationally distributed system of linked data source nodes. Information from regions of perennially and seasonally frozen ground will be assembled in National or Regional Geocryological Databases (NGDs, RGDs) or selected World Data Centers. The information will be made available to the scientific, engineering, environmental and policy communities.

The GGD will operate by identifying existing data sets, current and historic; rescuing those that are at risk of being lost; managing the acquired data; and making data available to the scientific and engineering communities either in raw form or processed into specific usable forms of information. Standard data descriptions will be held in national and international directories, and users will gain access to the data through a variety of modes and media. The IPA is working with user communities to identify priorities for data rescue, acquisition and monitoring. Initially, the emphasis is being placed on retrieving data and time-series that are in danger of being lost.

### **The GGD Process**

Once identified and described, data sets will be organized into standard file structures and accessioned by an appropriate NGD or GGD regional node. Currently, the designated nodes are:

- Federal Center for Geocryological Systems, Moscow, Russia
- GeoData Institute, Southampton, UK
- World Data Center A for Glaciology, Boulder, Colorado, USA
- World Data Center D for Glaciology and Geocryology, Lanzhou, China

The GGD nodes are using their existing in-house facilities, but are also developing additional funding to support NGD /GGD data rescue and management activities, as well as to promote information generation and dissemination through analysis and modeling.

Further working links have been established with other organizations pursuing similar goals for data rescue, monitoring, management and dissemination.

These include:

- Global Resources Information Database (UNEP/GRID), Arendal, Norway
- International Arctic Science Committee (IASC), Oslo, Norway
- Scientific Committee on Antarctic Research (SCAR) and Committee of Managers of National Antarctic Programs (COMNAP), Ad Hoc Planning Group on Antarctic Data Management, Cambridge, UK
- World Conservation Monitoring Centre (UNEP/WCMC), Cambridge, UK
- World Glacier Monitoring Service, Zurich, Switzerland

### **The Next Steps**

The Data and Information Working Group anticipates that the IPA, through the Council, will encourage the implementation of the GGD in the following ways:

- Develop an inventory of relevant national data sets.
- Compile approved data set descriptions into master directories, accessible to users.
- Retrieve priority data sets, and archive them in standard formats at National Database Centres or GGD nodes.
- Make the databases available to users through appropriate distribution media (diskettes, CD-ROM, hard copy) or online via FTP.
- Promote user-oriented analytical, modeling and mapping information products, based on NGD or GGD data sets.
- Concurrently develop funding proposals to national and international, governmental and non-governmental funding sources.

As stated, the initial emphasis of the GGD is on retrieving data and time-series that are in danger of being lost. To this end, participants in the Oslo workshop ranked selected permafrost variables, in terms of their relative priority (high, moderate, or low), for five key applications—process understanding, engineering design, model validation, change detection, and impact evaluation (Table 1). Comments on these rankings are welcomed as we anticipate the priorities will be reassessed as the GGD process develops. Recognizing the limited resources available for data retrieval tasks, the workshop also developed a number of recommendations for data rescue, archiving, and information management. Other, more technical and procedural results of the workshop included the preparation of drafts of a statement of protocol for data management, acquisition, and dissemination, and formats for data set information.

**Table 1. Results of priority setting study at GGD Workshop, Oslo, November 1994.**

PARAMETERS	APPLICATIONS				
	Process understanding	Engineering design	Model validation	Change detection	Impact evaluation
<b>Geometry</b>					
Permafrost extent	M*	H	H	H	M
Permafrost thickness	M	H	M	H	M
Active layer thickness	H	H	M	H	H
Ground ice extent	H	H	M	M	H
<b>Thermal State</b>					
Temperature<DZAA†	H	H	H	H	H
Temperature>DZAA	M	M	M	H	L
Thermal conductivity	H	H	M	L	L
<b>Composition and Properties</b>					
Moisture content	H	H	M	H	H
<b>Chemical composition</b>					
Soil	M	H	L	M	M
Water or ice	M	M	L	M	M
Trace gases	M	L	M	M	M

\* H, M, L = High, Moderate, and Low priority.

† Depth of zero annual amplitude.

Comments: Further discussion following this priority-setting exercise led to the conclusion that permafrost thickness should also have been divided into shallow and deep (or thin and thick), using the same depth division as used for temperature. Greater emphasis might have been given to trace gas composition, especially methane. Site descriptions (location, geology, vegetation, ownership) and meta-data (sampling techniques, equipment used, precision, post-processing) are included in the data description and were not prioritized separately.

The Data and Information WG invites all IPA member countries, working groups and interested individuals, wherever they are, to participate in and contribute to the GGD project. As a first step this requires completion of a data set description on the form being distributed with this issue of *Frozen Ground*. Readers of *Frozen Ground* are encouraged to complete and return the form to a member of the Data and Information Working Group or their national representative at their earliest convenience. The WG will report on the status and results of GGD activities to the IPA Council at its August 1995 meeting. The WG plans to convene a two-day meeting and workshop in Potsdam, Germany, following the Berlin Council meeting.

**Members:** H.J. Åkerman (Sweden), M.J. Clark (United Kingdom), Chen Xianzhang (China), E.S. Melnikov (Russia). Ex-Officio: F.E. Nelson, R.O. van Everdingen and N.N. Romanovskii.

**Corresponding members:** J. Branson (UK), C. Hanson (USA), M. Leibman (Russia), O. Gregersen (Norway) and M. Thorley (SCAR-COMNAP).

Submitted by J.A. Heginbottom

## Terminology

R.O. van Everdingen, Chair (Canada)

V. Konishchev, Secretary (Russia)

The eight-language permafrost and ground ice glossary is now 335 pages in length. In discussions with the Executive Committee, the decision was made to preprint 100 copies for internal IPA review and use, with distribution planned in early 1995. Anyone wishing a copy of the preprint should contact the Working Group Chair. A small fee may be charged for mailing. The diskette versions are still available. Commercial publication is being discussed; a decision will await initial reaction to the preprinted copy.

Qui Guoqing reports that the Chinese-Russian-English glossary was printed in May 1994 and is available for \$15.00 from the Lanzhou Institute. It contains over 600 terms and phrases; see Publications, page 27.

**Members:** H.J. Åkerman (Sweden), A.E. Corte (Argentina), F. Dramis (Italy), O.J. Ferrians, Jr. (USA), J. Karte (Germany), O. Gregersen (Norway), J.-P.

Lautridou (France), Qui Guoqing (China). Ex-Officio: N.N. Romanovskii.

**Corresponding members:** R.G. Barry (USA), E. Buk (Argentina), S.A. Harris (Canada), L. King (Germany), B. Ladanyi (Canada), M. Seppälä (Finland), C. Tarnocai (Canada), D. Trombotto (Argentina), T.S. Vinson (USA), Zhou Youwu (China).

Submitted by R.O. van Everdingen

## Global Change and Permafrost

F.E. Nelson, Chair (USA)

A.E. Taylor, Secretary (Canada)

Members of the working group met in San Francisco during the AGU meeting on 8 December. In attendance were Nelson, Taylor, Anisimov, Osterkamp, and newly appointed members Boike and Fukuda. An open meeting of the working group was also held following the special session on "Frozen Ground and Changing Climate" co-organized on behalf of the AGU's Snow, Ice and Permafrost Committee by this WG and the WG on Periglacial Processes and Environments. The session was dedicated to K.R. Everett, who died in October 1994. Approximately 50 participants attended from the seven countries represented at the special session. The WG reviewed past accomplishments and discussed future activities.

Members of the working group, joined by Brown and Hallet, met that evening. Considerable discussion took place on the role of the WG in GCM validation. During the Oslo data workshop (see p. 4) we discussed the need for a gridded data set for the permafrost region. Members of the WG agreed to exchange views with the GCM community and report on progress at the August 1995 Council meeting. Also discussed was our involvement in the assessment of trace gas emissions from permafrost terrain and ground ice.

The WG reiterated its interest in co-organizing the December 1995 AGU meeting and workshop on monitoring of permafrost and frozen ground. In preparation for it, the WG plans to develop an inventory of monitoring sites for continental permafrost regions, much like that underway by the Mountain Permafrost WG for the mountainous regions of the Earth.

During the past summer, in conjunction with the International Tundra Experiment (ITEX), we proposed a standard method for measuring active layer thickness using a gridded sample. Grids of varying dimensions from 100 m to the standard 1000 m have been established. Results and final procedures will be presented at the sixth ITEX workshop in Ottawa in April

1995. It is hoped that a network of sites will be fully operational in 1995 to complement shallow soil temperature and deeper borehole data and other point data. Results from late summer 1994 summer probing were:

	Average thaw depth (cm)
USA	
Barrow	35
Prudhoe Bay	55
Happy Valley	45
Canada	
Truelove Lowlands, Devon	30
Sweden	
Latnja (sorted circles)	150
Russia	
Labaz Lake, Taimyr	42
Levinson Lessing Lake, Taimyr	36
Yamal	86

**Members:** O.A. Anisimov (Russia), J. Boike (Germany), M.K. Gavrilova (Russia), T.E. Osterkamp (USA), M. Fukuda (Japan). Ex-Officio: Cheng Guodong (China), R.G. Barry (USA) and W. Haeberli (Switzerland).

Submitted by F.E. Nelson and A.E. Taylor

## Mountain Permafrost

W. Haeberli, Chair (Switzerland)

F. Dramis, Secretary (Italy)

The revised goals of the working group are to:

- Promote the application of computer (GIS) models for predicting permafrost occurrence as a function of digital terrain information;
- Organize intercomparison of results from modeling and field mapping of permafrost distribution patterns;
- Coordinate strategies and plans for long-term monitoring in view of ongoing and potential future warming trends;
- Encourage the investigation of energy exchange processes within the active layer;
- Improve the understanding of permafrost creep and rock-glacier formation in various high mountain areas and with special emphasis on hydrological conditions in dry areas and the stability of ice-supersaturated sediments on slopes.

In order to systematically collect information about ongoing and planned future activities in the field of mapping, modeling and monitoring of mountain permafrost, a questionnaire was sent to the working group members and other active mountain researchers.

With respect to mapping, interest focuses on natural indicators such as rock glaciers, perennial snowbanks, vegetation patterns, and summer/autumn temperature

of springs, and on geophysical soundings such as BTS measurements, summer temperature gradients in the active layer, electrical resistivity, seismicity, gravimetry and radar.

Up to now, models for numerically simulating permafrost distribution in mountain areas have been available at only a very few institutes. The goal is, therefore, to undertake a collaborative effort concerning various study areas for intercomparison. The availability of corresponding data sets (digital terrain information, grid resolution, scale of topographic maps, meteorological data) is being pursued.

Monitoring programs can be based on borehole observations, with the main background information covering localities, date and technique of drilling, borehole depth, borehole diameter, approximate mean 10-m temperature, estimated permafrost depth, measurement interval, sensors and data loggers used, borehole accessibility (recalibration possibility), lithology, ice content, hydraulic permeability, deformation, core material, water in the borehole during drilling, surface topography, snow conditions, vegetation and geomorphology. Other monitoring possibilities include long-term aerial photography and field observations on permafrost creep, frost heave thaw settlement, vegetation changes, snowbank size, debris flows, rock falls, drainage patterns, thermokarst, solifluction and patterned ground. Of special interest is long-term hydrological monitoring in permafrost areas (e.g. runoff, repeated tracer experiments).

Responses to the questionnaire have been received from Argentina, Austria, China, France, Germany, Italy, Japan, Kazakhstan, Norway, Russia, Switzerland and the USA. An overview will be presented at the 1995 AGU meeting on Monitoring of Permafrost and Frozen Ground (San Francisco, 11–15 December).

**Members:** S.A. Harris (Canada), N. Caine (USA), A.P. Gorbunov (Kazakhstan), M.M. Koreisha (Russia), D. Trombotto (Argentina), and J.L. Sollid (Norway). *Ex-Officio:* Cheng Guodong (China).

**Corresponding Members:** A. Corte (Argentina), G.K. Lieb (Austria), M. Evin (France), D. Barsch, L. King (Germany), N.N. Romanovskii (Russia) and R. Giardino (USA).

Submitted by W. Haeberli

## Periglacial Processes and Environments

A.G. Lewkowicz, Chair (Canada); C. Harris, Secretary (United Kingdom)

A joint meeting of the IGU Commission on Frost Action Environments and the IPA Working Group on Periglacial Processes and Environments took place 4–9 September in France. The theme of this highly successful meeting was “Periglacial Slope Deposits and Processes.” It was organized by Jean-Pierre Lauridou, Jean-Claude Ouzouf and Jean-Pierre Coutard of the Centre National de la Recherche Scientifique, Centre de Géomorphologie, Caen, France. The meeting included five days in the field examining sections, with the focus on grèzes litées (stratified slope deposits), and two half-day symposia, one at Reims and the other at Nancy. More than 35 participants from 10 countries attended. The greatest number of participants were from France (more than 20), followed numerically by Canada (5), Belgium (3), The Netherlands (2), and one each from Italy, Portugal, Romania, Russia, South Africa, and the United Kingdom (see photo).

The field component of the meeting covered a transect from the Charentes-Perigord area, 80–100 km north-east of Bordeaux (4–5 September), to the Champagne region, 120 km northeast of Paris (6–7 September), and thence to Lorraine, 250 km east of Paris (8–9 September). Much of the discussion in the field concerned the use of terminology, especially the term “grèzes litées” itself, and comparisons with other local terms. In addition, the origin of the bedded slope deposits was the subject of considerable debate, and a recent model developed by Bertran et al. (1992) with contemporary analogues in the Andes was compared with the field evidence. The possible influence of dry grain flow and debris flow was also considered. It seems probable that a mixture of mass movement and wash processes is responsible for many of the deposits, but the extent of stratification in some sections remains remarkably perplexing and difficult to explain.

Separate field guides for the three components were prepared and are available as follows: (1) Charentes-Perigord area, by J.-C. Ouzouf, J.-P. Coutard, J.-P. Texier and P. Bertran (56 p.), obtainable from the Centre de Géomorphologie du CNRS, 24 Rue des Tilleuls, 14000 Caen, France; (2) Champagne area, by A. Marre and M. Laurain (43 p.), obtainable from Institut de Géographie et Laboratoire des Sciences de la Terre, 57 Rue Taittinger, 51100 Reims, France; and (3) Lorraine area, by D. Harmond, A. Weisrock, S. Ghanimi,



Participants in the Colloquium on Periglacial Slope Deposits seen at the Verteuil section, 4 September 1994, included: Back row (l to r): A. Augustia, B. Hétu, P. Bertran, J.-P. Texier, F. Dramis, P. Urdea, A. Prick, S. Konik, J.-P. Lautridou, C. Harris, G. Couvreur, J. Boelhouwers, J. Vandenberghe, M. Leibman, A. Marre, H. van Steijn, M. Brocandel and H. Guerin. Front row: J.-C. Dionne, J.-C. Ozouf, J.L. Meireles Batista, A. Pissart, A. Weisrock, S. Harris, I. Heyse, H. French, A. Lewkowicz, and J.-P. Coutard. (Photograph: A.G. Lewkowicz.)

M. Deshaies and O. Lucas-Leclin (74 p.), obtainable from the Laboratoire de Géographie, LORQUA, 23 Boulevard Albert 1er, 54000 Nancy, France.

Twelve papers were presented during the two half-day symposia. Topics covered a wide range of slope processes and deposits, including frost creep and gelifluction experiments, stratification of slope deposits, debris flows, periglacial involutions, and active layer detachment sliding. An abstracts volume is available from the organizers. A special issue of *Permafrost and Periglacial Processes* is expected to be devoted to these papers.

The US members of both this working group and the Global Change and Permafrost Working Group co-organized a special session of the AGU fall meeting, "Frozen Ground and Changing Climate." A total of 28 abstracts for posters and oral presentations from Canada, Czechoslovakia, Germany, The Netherlands, Russia and the USA were published in *Eos, Transactions of the American Geophysical Union*, volume 75, 1994 supplement, p. 75–78 and 84–86. Plans for the 1995 AGU workshop on Monitoring of Permafrost and Frozen Ground and the 1996 field trip to the Canadian High Arctic (see inside back cover) are in preparation.

**Members:** H.J. Åkerman (Sweden), Cui Zhijiu (China), B. Hallet (USA), A. Pissart (Belgium), V. Solomatina (Russia), J. Vandenberghe (The Netherlands). Ex-Officio: J.-P. Lautridou (France).

Submitted by A.G. Lewkowicz and C. Harris

## Cryosols

D.A. Gilichinsky, Chair (Russia)  
C.L. Ping, Secretary (USA)

The international cryosol field program in the Lower Kolyma region of Russia was held from 26 July to 9 August 1994. The program was under the auspices of the Cryosols WG of the IPA and the International Society of Soil Science (ISSS). Upon arrival the participants met with the logistics host, Sergey Zimov, and his staff to discuss the work plan and logistical needs. The participants were divided into three groups: 1) the soil sampling group led by Ping, Kimble and Gubin; 2) the mapping group led by Tarnocai, Mazhitova and Moore; and 3) the palynological group led by Eisner.

Participants included:

Charles Tarnocai and Scott Smith, Agriculture  
Canada

Zhao Lin, Lanzhou Institute of Glaciology and  
Geocryology, China

Bjarne Jakobsen, University of Copenhagen,  
Denmark

Eva-Maria Pfeiffer, University of Hamburg,  
Germany

Galena Mazhitova and Vera Alabieva, IBPN,  
Russia

Stas Gubin and Dimitri Fedorov-Davidov,  
Institute of Soil Science and Photosynthesis,  
Russia



Several members of the Kolyma cryosol study. (Photo provided by J.M. Kimble.)

Sergey Zimov, Northeast Scientific Station,  
Russian Academy of Sciences, Russia  
Chien-Lu Ping and Yuri Shur, University of  
Alaska–Fairbanks, USA

Wendy Eisner, Ohio State University, USA  
James Bockheim, University of Wisconsin, USA  
Joseph Moore and David Swanson, US  
Department of Agriculture, Alaska, USA  
John Kimble and Robert Ahrens, US Department  
of Agriculture, Nebraska, USA  
Larry Huber, Huber's Agro Services &  
Associates, USA

The field program was successful in that the projected goal of joint sampling of ten pedons and study of profiles along several transects was reached. During site selection and sampling the participants exchanged ideas on the formation and classification of cryosols. The mapping group achieved its goal by exchanging ideas on map unit design and delineation of the landscape. Soil maps were compiled and the final products are to be circulated in the near future. The joint sampling and mapping activities provided an excellent opportunity for the working groups to compare soil classification systems, to field test the proposed Gelsol Order addition to U.S. Soil Taxonomy, and to compare mapping procedures and map unit design concepts.

S. Zimov's staff provided all the logistical support, including vehicles and boats. All participants were accommodated in the staff houses of the Cherskiy Research Station. The invitations and soil sample export documents were issued by the Institute of Biological Problems of the North (IBPN), Russian Academy of

Sciences, Magadan. The charter flight was arranged by Atis America for the Alaska/Yukon Society of Professional Soil Scientists. In addition to the support from the participating organizations and individuals, the IPA contributed \$2000 toward transportation and logistics.

The success of this joint program is the result of excellent teamwork, with special thanks to S. Zimov and his staff at Cherskiy. We are also obliged to Felix Chernyavsky, Director, IBPN, for inviting us and issuing the soil sample permit; to Daniel Berman for his hospitality and legal assistance; and to Galena Mazhitova for coordination in Magadan. We also thank Stas Gubin, Institute of Soil Science and Photosynthesis (ISSP) for providing his local expertise in the Lower Kolyma region. The excellent translation provided by Galena Mazhitova, David Swanson, and Yuri Shur is greatly appreciated.

A symposium on "Genesis, Classification, and Management of Permafrost-Affected Soils" was held 14 November 1994 during the 86th annual meeting of the Soil Science Society of America in Seattle, Washington. The symposium was organized by J.G. Bockheim, J.M. Kimble, and R.J. Ahrens and included presentations from cryopedologists from five nations. In the morning session, eight oral presentations were given, including keynote addresses by C. Tarnocai (Canada), D.Y. Konyushkov (Russia), and A.V. Alfimov (Russia). During the afternoon session, 15 posters were displayed and a group discussion was held. Members of ISSS and IPA cryosol working groups met during the conference to discuss future plans, including participation in the 1995 AGU workshop on monitoring (see p. 8).

The working groups have discussed and proposed the following:

- 1) The ISSS Cryosol Working Group be co-chaired by Bjarne Jakobsen (Denmark) and James Bockheim (USA).
- 2) The joint soil mapping study be continued in interior Alaska, in the Canadian High Arctic, and in northern Greenland and Tibet; Tarnocai elaborated upon these plans in a memo dated 19 August 1994 that was distributed to all participants.

The Second International Conference on Cryopedology is planned for 1996 in Syktyvkar, Russia.

**Members:** J. Bockheim (USA), G. Broll (Germany), Wang Haoqing (China), B. Jakobsen (Denmark), G. Mazhitova (Russia), C. Tarnocai (Canada). **Ex-Officio:** J. Brown (USA).

Submitted by C.-L. Ping and J.G. Bockheim

## Foundations

J.W. Rooney, Chair (USA)

K. Flaate, Secretary (Norway)

Several members of the working group met in Oslo, Norway, during the GGD workshop. There is little progress to report on the two monographs agreed to in March 1994: "State-of-the-Practice on Foundation Investigation Programs in Permafrost" and "Monograph on Permafrost and Oil-Gas Development." It was agreed to plan a WG meeting in the Moscow region (Pushchino) during the meeting of the Scientific Council on Earth Cryology (25–27 April 1995), since one theme of the meeting is very relevant to our interests: "The Problems of Engineering Construction Stability in Permafrost Areas under Global Climate Change" (see p. 17). An assessment of future plans and progress will be provided to the Council in August.

**Members:** R.M. Kamensky (Russia), L. Khrustalev (Russia), P.J. Kurfurst (Canada), R.G. Tart, Jr. (USA), Zhu Yuanlin (China). Ex-Officio: A. Phukan (USA).

**Corresponding members:** D.C. Sego, Don Hayley,

B. Ladanyi, K. Jones (Canada), Mait Mets (Estonia), K. Senneset, Odd Gregersen (Norway), S.E. Grechishchev, E.S. Melnikov (Russia), and C.W. Lovell and B. Shen (USA).

Submitted by K. Flaate

## Seasonal Freezing and Thawing of Permafrost Areas

A. Phukan, Chair (USA)

B. Ladanyi, Secretary (Canada)

Several members attended the 7th International Symposium on Ground Freezing in Nancy, France (24–28 October 1994). A proceedings volume is available from the symposium. The working group will be encouraged to establish closer ties between the Ground Freezing Symposium and IPA activities.

**Members:** M. Fukuda (Japan), H.L. Jessberger (Germany), S. Knutsson (Sweden), G.Z. Perlstein (Russia), K. Senneset (Norway), E. Slunga (Finland). Ex-Officio: J.W. Rooney (USA).

## NEWS FROM MEMBERS

We thank the individual members for providing reports of activities from their Adhering Bodies. Particular thanks to Lorenz King (Germany) for faithfully serving as the regional reporter for Europe. Our Spanish colleagues provided an extensive report of their activities, but, unfortunately, space limitations prevented publication in full. Starting with this issue of *Frozen Ground*, news items that have come to our attention, but were not necessarily provided by members, are being added to these country reports. We hope this helps disseminate information of broader interest.

### Canada

Over the last year, the main activity of the Canadian National Committee for the IPA (CNC-IPA) has been the process of organizing the VII International Conference on Permafrost, to be hosted by Canada in June 1998 in Yellowknife, NWT. The CNC has set up a small executive committee, identified leaders for key functions (particularly local arrangements, technical program, and field excursions), and begun recruiting committee members and raising funds. A formal announcement of the conference will be made in mid-1995. The CNC held its annual meeting in Halifax, Nova Scotia, 23–24 September 1994. General committee business was carried out on 23 September, when the committee received reports on the IPA Executive Committee meeting; on IPA activities, working groups and committees; and from other Canadian organizations, the Cold Regions Division of the Canadian Geotechnical Society, and the Permafrost Committee of the Science Institute of the NWT/Arctic College (see below). Planning for the international conference occupied the committee on 24 September.

As in previous years, the CNC meeting was held directly following the annual conference of the Canadian Geotechnical Society. The 47th Canadian Geotechnical Conference included a session of four papers on "Pile Load Testing in Permafrost," organized by the Cold Regions Division. At the Cold Regions Division annual business meeting, a new committee was proposed; the members' names will be announced in January 1995. This year the Roger J.E. Brown Award was presented to Prof. Kevin Biggar, Royal Military College, Kingston, and Prof. David Segó, University of Alberta, Edmonton, for the two papers

"Field Pile Tests in Saline Permafrost. I. Test Procedures and Results" and "Field Pile Tests in Saline Permafrost. II. Analysis of Results." Both were published in the *Canadian Geotechnical Journal*, volume 30, in 1993. These papers were based on the doctoral research of Biggar, under the direction of Segó. (For details of the Roger J.E. Brown Award, see *Frozen Ground* No. 8, December 1990.) The 48th Canadian Geotechnical Conference will be held in Vancouver, BC, 25–27 September 1995. At this conference, the Engineering Geology Division will join with the Cold Regions Division in organizing a session on "Mass Wasting in Permafrost Regions."

The Science Institute of the Northwest Territories is in a state of flux, and its Permafrost Committee is presently inactive. The Science Institute is being merged with Arctic College, which is a community college and training institute. The combined entity is to be divided into western and eastern units, probably to be based in Inuvik and Iqaluit, in anticipation of the division of the Northwest Territories into two new territories in 1999. This territorial division follows from the settlement of the land claim of the Inuit of the NWT; the eastern Canadian arctic region will become the Nunavut Territory.

Submitted by J.A. Heginbottom  
Secretary, CNC-IPA

### China

The First National Youth Workshop on Cold Regions Environment and Engineering was held at Lanzhou, China, 2–6 September 1994. It was organized by the State Key Laboratory of Frozen Soil Engineering, Lanzhou Institute of Glaciology and Geocryology, the Chinese Academy of Sciences and the Chinese Society of Glaciology and Geocryology. More than 40 participants from 15 institutes, universities and organizations attended this workshop. The young researchers and engineers exchanged ideas and discussed their achievements and experience in research on cold regions environment and engineering. The proceedings of this workshop, which includes 39 papers, has been published in Chinese. The Chinese Youth Society of Cold Regions Environment and Engineering was founded during this workshop. It was decided that this workshop will be held once every two years, and the next workshop will be held at Dalian, China, in 1996.

The First Chinese National Symposium on Frozen Soil and Ice Mechanics will also be held at Dalian 5–9 June 1995. This symposium is being organized by the State Key Laboratory of Frozen Soil Engineering, the Dalian University of Technology, and the Monitor Centre of Sea Environment, the State Sea Bureau. The first announcement of this symposium has been sent out.

Activities at the State Key Laboratory of Frozen Soil Engineering continue with numerous test results being published. The CT scanning technique has seen its first successful use to observe the development of micro-cracks in frozen soil and ice specimens during deformation. Three-point bending tests on a frozen beam were successfully conducted in this laboratory, and the test results will be published soon.

Research and planning of future programs continue at the Plateau Station. These include studies of periglacial phenomena, monitoring of borehole temperatures (based on 20 years of records and a 203-m-deep borehole), moisture and heat flow in frozen ground, permafrost ecology, and the effects and measurement of greenhouse gases. Details about these activities are available from Zhao Xiufeng at the LIGG.

Submitted by Zhu Yuanlin

## Denmark

Membership of the Danish Society for Arctic Technology includes 20 companies and institutions, 85 private members and 2 students. Of these, 37 receive, at their request, *Frozen Ground*. In Greenland, we collaborate with our sister organization, the Greenland Technological Society. The new Chairman for the Danish Adhering Body, the Danish Society for Arctic Technology (SAT), is Sven Bertelsen. Bertelsen is a director of the consulting engineering firm N&R Consult A/S (from 1 January 1995, Nellemann, Nielsen & Rauschenberger A/S). N&R Consult has been involved in arctic engineering since the late 1950s. Through work mainly in Greenland, extensive knowledge of permafrost related to engineering has been gained.

With a change in the SAT chair, the address has also recently changed: Danish Society for Arctic Technology, N&R Huset, Sortemosevej 2, DK-3450 Allerød, Denmark.

Several other international organizations are represented in Denmark at the Danish Polar Center, which represents Danish interests on many international com-

mittees. Secretariats for the Man and the Biosphere (MAB) Northern Sciences Network (NSN) and the International Tundra Experiment (ITEX) are located in the DPC. For more information contact The Danish Polar Center, Strandage 100H, DK-1401, Copenhagen, Denmark (E-mail: dapchth@pop.denet.dk).

Submitted by H.N. Mai  
Secretary, Danish Society for Arctic Technology

## France

As a result of restructuring at CNRS, Caen, the Centre de Géomorphologie is now a URA (Unité de Recherche Associée) of the Centre National de la Recherche Scientifique. The laboratory is associated with the geologists of the universities of Caen and Rouen (Normandy). This new unit depends on the department SDU (Sciences de l'Univers) of the CNRS, which is mainly composed of geologists and of experts on the atmosphere and oceanography. The name of the URA is "Geomorphology and Surface Transfers" (URA 1694).

There are three main teams:

- Milieux extrêmes (J. Aguirre-Puente, director of the unit): physics of the frost, planet Mars, and arid zones
- Superficial formations, Quaternary (J.P. Lautridou and J.L. Lagarde)
- Exchanges between water and sediments at the contact of the continent and the ocean (J. Avoine and R. Meyer)

The French Periglacial Association (*l'Association Française du Pergélisol*) has now opened its membership to geologists and geophysicists. The association has also published the first issue of an annual journal entitled *Environnements Périglaciaires*. This journal will publish articles in English or French, and will accept for publication material which is not suitable for inclusion in major journals, such as data sets, abstracts of doctoral theses, and so on. The following passage, which is taken from this first issue, is from an editorial by Brigitte Van Vliet-Lanoe, the President of the French Periglacial Association.

### Periglacial Perspectives

Some questions to be addressed in the coming years by the French Periglacial Association:

1. What is the climatic significance of periglacial structures observed at the present time in the Arctic and in mountainous regions or those of their fossil homologues in our regions? Is the parallelism between

present conditions in mountains and Weichselian landscape valid?

- How did different continents react in (peri)glacial time?

2. What has been the zonal distribution of permafrost in Europe since Pre-Tiglian time (2.5 Ma)?

- What are the mechanical or climatic relationships between periglacial and Cenozoic tectonic movements? Which tectonic structures could be confused with periglacial phenomena?
- How representative are specific observations of periglacial phenomena, in a given area and morpho-sedimentological setting, in relation to the extent of permafrost at different times during the Last Glaciation?

3. What is the real effectiveness of erosion in a periglacial context?

Submitted by J.-P. Lautridou

## Germany

The German Geoscientific Spitsbergen Expedition 1990–1992 consisted altogether of about 45 scientists from 14 different universities. The expedition results have since been published, with many results appearing in the latest volume of *Zeitschrift für Geomorphologie*, Supplementband 97, N.F., 1994. A bibliography of expedition results may be obtained from Prof. Lorenz King (see addresses, p. 31).

The Geographical Institute of the Justus Liebig University, Giessen, has again begun its permafrost studies in the Zermatt/Gornergrat area of the Swiss Alps. The main research topics are permafrost distribution and its implication for construction (e.g. buildings, cable cars). At the same institute, comparative studies on the regeneration of Arctic and Subarctic ecosystems after human disturbances have been continued in Swedish Lapland (Kiruna mining site), a continuation of the former studies of E. Schmitt in Spitsbergen (Longyearbyen) and Canada (Mackenzie Mountains).

In the field of permafrost engineering, two shafts were constructed in Germany for the exploration of a salt dome near Gorleben, which was selected because it may become a permanent deposit of radioactive waste. To stabilize the soil during shaft-sinking in unstable, water-bearing strata, the soil was frozen to a depth of 270 m. The shaft linings were designed as sliding lining systems, which are characterized by a bedded outer lining and an inner lining supported on a foundation and separated by an annulus filled with an asphalt mass.

The long construction period of ten years was due to many technical and administrative problems, which were solved by the fruitful cooperation of the employer, contractor, control boards and experts. For example, the control of high stresses inside the soft clay layers required installation of a stiff outer steel lining instead of the weak concrete block lining. The experience and the technical developments gained by this construction were a topic of the symposium “Gefrierschächte Gorleben” held on 21–22 September 1994 at Bochum and organized by the Geotechnical Institute, Ruhr-University, Bochum. The proceedings of the symposium will be published at the end of 1994. Other international publications on this topic will follow.

The 7th International Symposium on Ground Freezing was held in Nancy, France, from 24–28 October 1994. Papers presented during five sessions covered heat and mass transfer, mechanical properties, case histories, environmental soil freezing, and engineering design. The proceedings are available.

Submitted by H.L. Jessberger and L. King

## Italy

The Italian Adhering Body of the International Permafrost Association, which is composed of some 40 researchers belonging to several universities and research centers, is presently working on several research projects.

Most of the efforts are devoted to high mountain permafrost, which is present throughout the Alps. There, research in progress mostly deals with characterization of rock glaciers and other permafrost-related features, such as landslides affecting partially frozen slopes (a huge one recently affected the Valtellina).

In the Apennines, both fossil (i.e. stratified slope-waste deposits and rock glaciers) and “active” phenomena have been studied. Regarding the latter, the BTS measurements have confirmed the presence of permafrost in a valley located close to the top of Mal-ella Mountain in the Abruzzi region of central Italy. Fresh-looking rock glaciers have been identified, thus fixing a new southern limit of sporadic permafrost for the whole Northern Hemisphere.

In addition to these studies on mountain permafrost, an investigation of periglacial phenomena in the Terra Victoria (Antarctica) has been initiated. Research was planned to begin by late October, while preliminary studies (photo interpretation, etc.) were already underway.

A pre-conference excursion is being planned within the framework of the Fourth International Conference on Geomorphology, to be held in Bologna during summer 1997. This event, organized together with W. Haerberli and the IPA Working Group on Mountain Permafrost, will deal with mountain permafrost and slope stability in the periglacial belt of the Alps, and will include a scientific meeting as well. A post-conference field trip in central Italy has been scheduled which will illustrate fossil periglacial (i.e., stratified slope-waste deposits and, subordinately, rock glaciers) and glacial phenomena, including the only active glacier in the Apennines.

Submitted by F. Dramis

## Japan

Joint Siberian permafrost studies between Japan and Russia were conducted in summer 1994. Thirty-one researchers from various institutes in Japan joined this program. There were five groups in different research fields:

1. Permafrost  
Objective: Permafrost response to global change of climate  
Members: Institute of Low Temperature Science, Sapporo; Permafrost Institute, Russian Academy of Science, Yakutsk; Department of Cryolithology and Glaciology, Moscow State University  
Research sites: Big Lhyavosky Island, Oyagosky Yar, Duvani Yar  
Participants: Japan 4, Russia 8
2. Biology  
Objective: Diversity of fauna and flora in Siberia region  
Members: Institute of Low Temperature Science, Sapporo; Institute of Biology, Russian Academy of Sciences, Yakutsk  
Research sites: Oymiyakon region, upper Aldan River  
Participants: Japan 4, Russia 8
3. Atmospheric science  
Objective: Monitoring greenhouse gases over Siberia  
Members: Institute of Environment, Tsukuba, Japan; Central Agency of Aero-Observatory, Moscow; Permafrost Institute, Yakutsk  
Research sites: central, northeast and west Siberia; traverse monitoring by aircraft; ground-truth monitoring in central Yakutia and west Siberia  
Participants: Japan 12, Russia 20

4. Forestry  
Objective: Function of taiga and tundra as reservoir of carbon  
Members: Forest Research Institute, Sapporo; Institute of Biology, Yakutsk; Institute of Forestry, Krasnoyarsk  
Research sites: Central Yakutsk, Tiksi  
Participants: Japan 8, Russia 14
5. Water budget and heat study (WCRP/BEWEX)  
Objective: Global budgets of water and heat from ground surface  
Members: Institute of Atmospheric and Water Resources, Nagoya Institute of Geography; Russian Academy of Sciences, Moscow  
Research sites: Upper, middle and lower regions of Lena River  
Participants: Japan 3, Russia 2

The joint symposium on this study is planned for 22–23 March 1995 at Yakutsk. About 30 papers will be presented. The conveners of that meeting are Masami Fukuda, Institute of Low Temperature Science, Sapporo, and R.M. Kamensky, Director, Permafrost Institute, Yakutsk. Additional information is available from M. Fukuda, Institute of Low Temperature Science, Sapporo, Japan (Fax: 81 11 706 7142; E-mail: masami.fukuda@lt.hines.hokudai.ac.jp). Three volumes of reports on this joint program have already been published. A few copies are available; please contact the above address.

Japan and Argentina are planning joint field studies at James Ross Island, Antarctica, this austral summer. Two Japanese researchers will join the program, cooperating with the Instituto Antartico Argentino, Buenos Aires.

Submitted by M. Fukuda

## The Netherlands

Between 1990 and 1994 several Dutch research groups cooperated in the Greenland Ice Margin Experiment (GIMEX). This program concentrated on the mass balance of the west Greenland ice sheet and its sensitivity to climatic change, including the Holocene deglaciation history. In the latter part of the program attention was paid to permafrost and its effect on glacial dynamics in the frontal zone of the ice sheet, e.g. on ice-cored moraine formation. In order to study present-day permafrost conditions, temperature data spanning 15 years from a 15-m-deep permafrost profile at Kangerlussuaq airport were analyzed with Danish colleagues. They have been compared with shallow temperature profiles in the study area. In 1993 and

1994 further field studies concentrated on permafrost thickness and distribution, frost mound development (both seasonal and multi-annual), and ice wedge polygons.

The Geological Survey of The Netherlands and the three Departments of Physical Geography of the universities of Amsterdam and Utrecht regularly study periglacial and permafrost-related phenomena as part of a mapping program and other investigations in Pleistocene sequences and present-day environments, not just in the Netherlands but also in the Alps and Antarctica.

Submitted by J.J.M. van der Meer

## Norway

A professorship in Arctic Technology has recently been established at the Faculty of Civil Engineering, Norwegian Institute of Technology (NTH), University of Trondheim. It has been financed by NTH and the Norwegian oil company Statoil for an initial period of two years. The professor will be given the responsibility to coordinate research and education within different departments at NTH as well as to be in contact with other disciplines of arctic interest at the University of Trondheim. Primarily the topics of interest for education and research in civil engineering are ice conditions, ice mechanics, ice forces on structures, permafrost and foundation engineering for structures, and infrastructure on land and offshore. In 1993, The University Courses on Svalbard was established. During the first year, courses on arctic geology, arctic geophysics and arctic biology were given. Starting in 1996 the curriculum will include courses in polar technology. A committee including Professor Kaare Senne set of NTH is discussing the content and format of the courses. A building for the institution is now under construction in Longyearbyen. The University Courses on Svalbard is planned to have about 100 students and a staff of 16–18.

The permafrost observation station in Svea, Svalbard, installed in 1977, is still in full operation. Meteorological data have been recorded continuously over a period of 17 years. Data collection is performed automatically, with registration every hour on three separate dataloggers (36 channels). The observations cover air temperature, wind force and direction, ground temperature down to 8 m below the soil surface and 2 m below a concrete surface, incoming and outgoing radiation, global radiation, heat flux in the ground, and humidity of the air. Altogether, 30 observations are made per hour. The data have been processed and

converted to physical values. Based on the temperature data important information for thermal calculations, such as thaw depths and thawing indexes, have been calculated. Furthermore, design charts of return periods have been prepared for thaw depth ( $0^{\circ}\text{C}$  isotherm) and thawing index.

Georadar has over recent years become a much-used method for mapping of permafrost soils in Svalbard. The method provides information on depth to permafrost, ground ice, depth to bedrock and bedrock quality. The method is fast and is cost-effective compared to traditional techniques. The equipment used is a newly developed, improved type of georadar. The main distinguishing feature of the georadar, developed at the Norwegian Geotechnical Institute (NGI), is the use of frequency-synthesized signals, where most commercially available systems use impulse signals. The advantage of using frequency-synthesized signals is that the bandwidth of the radar signal can be varied by software. This, together with experience gained at NGI in the design of wideband antennas, ensures radar detection of short distance targets (e.g., penetrating a 50-m rock layer). The method has proved reliable in permafrost and will most certainly be used more and more in the future. Georadar has already resulted in a considerable reduction in the cost of soil investigations in Svalbard.

Professor Johan Ludvig Sollid, Department of Physical Geography, University of Oslo, has been engaged in permafrost studies on Svalbard and in mountain areas in mainland Norway. This activity increased during the 1980s and early 1990s. A group from this department participated in a joint project on Kvadehuksletta, Spitsbergen, with the Periglacial Laboratory, Quaternary Research Center, University of Washington (Bernard Hallet), and later in a German-led project, Stofftransport Land-Meer in Polaren Geosystem, in 1990–1992. In 1994 the group in Oslo started working with the newly established University Courses on Svalbard (UNIS) located in Longyearbyen. The research activity has been concentrated in four fields: mountain permafrost mapping and prospecting, hydrology and sediment transport of glacier-dominated drainage basins in permafrost, the thermal regime of coastal cliffs on the west coast of Spitsbergen, and prospecting of possible future drilling sites on rock glaciers on Svalbard. The latter project is in cooperation with ETH, Zürich (Wilfried Haeberli). Traditional techniques for permafrost mapping and prospecting have been used in Norway and Svalbard, such as measurements of the bottom temperature of the winter snow cover (BTS), DC resistivity soundings, seismic refraction, and temperature measurements with ther-

mistors. GIS tools have been used in analysis and presentation of field data. The permafrost mapping in southern Norway has resulted in a small-scale permafrost map of the area. From coastal cliffs in Spitsbergen, three years of near-surface temperature data have been collected from two different sites.

Submitted by K. Flaate, O. Gregersen  
and J.L. Sollid

## Poland

In summer 1993 studies were carried out on permafrost in the Hornsund region (southwest part of Wedel Jarlsberg Land), as well as in the Bellsund region (northwest part of Wedel Jarlsberg Land) in Western Spitsbergen. The investigations in the Hornsund region were a continuation of the measurements carried out there by Wroclaw University expeditions since 1988. They covered mainly tundra thawing and freezing processes and frost movements of the ground on flat and sloping areas.

Studies of thermal and dynamic conditions of the active layer in the Bellsund region have been carried out since 1986. They are a part of complex studies of the natural environment conducted by the Polar Expeditions of Maria Curie-Sklodowska University, Lublin. Calypsostranda, the coastal plain situated on the western border of the Recherche Fiord and adjacent to the foreland of Scott and Renard Glaciers, is composed of a system of raised marine terraces built of Quaternary formations deposited on Tertiary rocks. This area has been an object of special investigations. The thickness of the active layer was determined by means of a sounding method and using Danilin permafrostmeters. In summer (July, August) 1993, several measurements were made at 150 sites situated within the ecosystems typical of the tundra region. They are localized in the flat area along N-S and E-W transects, as well as on various slopes. The relations between meteorological conditions, relief, slope exposure, geological structure, vegetation, humidity and active layer dynamics have been studied.

The results of the studies carried out in 1993 are being elaborated upon. A synthesis report on the studies in 1986–1993 is in preparation. Some of these results were presented at the VI International Conference on Permafrost by Migala, Bartoszewski and co-authors.

Poland has a long tradition in permafrost research on Spitsbergen as well as in Antarctica. Research is mainly concentrated around the Polish stations Hornsund (77°N, founded in 1957) and Henryk Arctowski (King George Island, Antarctica, founded in 1977).

Results of recent research done were presented at the 21st Polar Symposium that took place in Warsaw on 23–24 September 1994. The proceedings volume is titled *21st Polar Symposium—60 years of Polish Research of Spitsbergen*. Edited by S.M. Zalewski, it presents 54 contributions on 371 pages (in English) in the fields of geology and paleobiology, geophysics, geomorphology and Quaternary geology, pedology, physical geography, hydrology, glaciology, climatology and biology. Many contributions are permafrost-related.

Submitted by K. Pekala and L. King

## Russia

Two conferences are planned for 1995. The International Conference on Global Change and Geography of the International Geographical Union will be held in Moscow 14–18 August 1995, following the INQUA Congress (see p.29). Permafrost-related sessions include 1) Frost and glaciers over the Earth: Key regions and processes of global change, and 2) Polar regions in the development of the Earth and humanity.

The Scientific Council on Earth Cryology of the Russian Academy of Sciences will convene its annual meeting in Pushchino on 25–27 April 1995 (see p. 29). The main problem of the meeting is: “Evolutionary Geocryological Processes in the Arctic Regions and Problems of Global Changes of the Environment and Climate in Permafrost Areas.” IPA members and other foreign specialists are invited to participate in the conference meetings.

The topics for discussion and presentation of results are:

1. Investigation and prediction of permafrost evolution: Monitoring, modeling, prediction and local prognosis
2. Problems of engineering construction stability in permafrost areas under global climate change
3. Thermo-abrasion of Arctic shorelines and the possibility of regulating such processes
4. Gas hydrates and radiatively active gases in the cryolithozone
5. 25 years of Scientific Council on Earth Cryology: Results and Perspectives

## Southern Africa

The committee members of the Southern African Permafrost Group (SAPG) changed in 1994. The new committee members for 1994–1995 are:

President Margaret Marker  
 President Elect Stefan Grab  
 Secretary/Treasurer Wilson Rooy

Ian Meiklejohn of Pretoria University has been proposed as the new SAPG representative to the IPA council.

Kevin Hall has moved to Canada and can be contacted at the Geography Department, University of Northern British Columbia, Prince George, British Columbia V2L 5P2, Canada. E-mail: hall@unbc.edu

Several members of the SAPG attended a field meeting organized by C. Lewis on Glacial, Periglacial and Colluvial Features, in East Cape Drakensberg. Plans are underway to involve the SAPG in IGCP Project 341, which is organizing a meeting on Southern African Palaeo- and Neo-Climates, 26–30 April 1995, in Cape Town. Further information is available from J. Boelhouwers, Department of Earth Sciences, University of the Western Cape, Private Bag X17, Bellville 7535, South Africa.

Submitted by W.J. Rooy

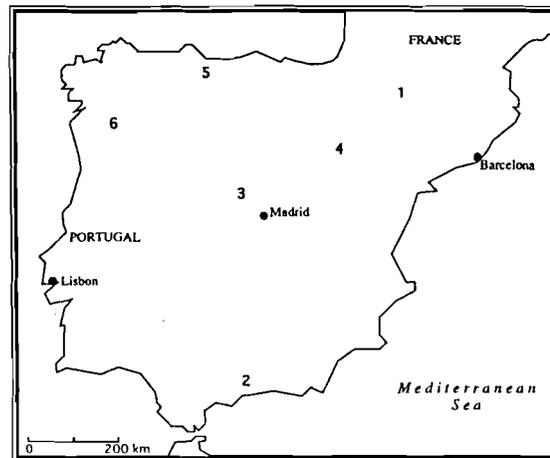
## Spain\*

Research into the geomorphology of cold regions has been undertaken principally by Spanish universities and the Consejo Superior de Investigaciones Científicas (Higher Council of Scientific Research—CSIC). Emphasis prior to 1970 had been on mountain glaciation—localizing areas of glacial activity, identifying morphologic registers, dating events in relative terms, mapping, etc. Researchers included Barrère, García Sainz, Gómez de la Llarena, Hernandez Pacheco, Llobet, Nussbaum, Obermaier, Pashinger, Solé and Vidal Box.

Later, mainly through the influence of French researchers, geomorphology associated with ground ice became important. This has resulted in research into cold regions (glaciation and periglaciation) by Spanish scientists since the mid-1970s.

Most recently, research has centered on identifying and quantifying present high mountain periglacial processes, which are seen as determining factors in the evolution of the landscape (Gómez Ortíz and González Martín). Most of the research programs are being undertaken in the different peninsular mountains (the

\* Original manuscript prepared by Gómez Ortíz and David Palacios. This summary prepared by David A. Keadle, Arizona State University. The complete report is available from David Palacios, Chairman, Spanish Group Committee, IPA.



Pyrenees, the Betic Mountains, the Central System, the Iberian Chain, the Cantabrian Chain, the Northwest Massifs) and the insular mountains (volcanic structure on Tenerife in the Canary Islands and also in the Castilian interior and the neighboring piedmonts of the Iberian Range).

Currently the three major fields are:

- Old and recent geologic manifestations
- Present dynamic processes and their impact on the landscape
- The evaluation of natural hazards

Geographical areas (see map) and research teams are:

### 1. The Pyrenees

The Universities of Zaragoza and Barcelona, the Autonomous University of Madrid, the Pyrenees Centre of Ecology (CSIC), and the Institute of Ecology of the Pyrenees. Researchers: Martínez de Pisón, Nicolas Martínez, Serrano Cañadas (Dept. of Geography, Autonomous University of Madrid); Peña Monné, Chueca Cía, Lampre Vitaller (Dept. of Geography, U. of Zaragoza); Serrat Congost, Vilaplana, Bordnan (Dept. of Dynamic Geology, Geophysics, and Paleontology, U. of Barcelona); Gómez Ortíz, Sálvador, Estebán Amat (Dept. of Physical Geography and the Servei de Gestió i Evolució del Paisatge [SGEP], U. of Barcelona); García Ruiz, Martí-Bono, del Barrio, Albera (Inst. of Ecol. of the Pyrenees).

### 2. Betic Mountains

Universities of Granada, Barcelona, and Seville. Researchers: Simon Torres, Sánchez, Gómez Ortíz (Dept. of Pedology, U. of Granada); Gómez Ortíz, Sálvador, Estebán Amat (SGEP, U. of Barcelona); Díaz del Olmo, Baena Escudero (Dept. of Geography, U. of Seville).

### 3. Central System

Universities of Madrid (Complutense and Autonoma).

Researchers: Pedraza, Carrasco González, Díez Herero, Martín Duque (Dept. of External Geodynamic, U. Complutense); Palacios, de Marcos (Dept. of Regional Geographic Analysis and Physical Geography, U. Complutense); Martínez de Pisón, Bullón Mata, González Martín, Tello Ripa, Sanz Herraiz (Dept. of Geography, U. Autonoma).

#### 4. Iberian Mountain System and the Tajo Basin

Universities of Zaragoza, La Rioja, and Autonomous University of Madrid, and the Institutes of Economic Geology and Environmental Sciences (CSIC). Researchers: Peña Moné, Pellicer Corellano, Lozano Tena (Dept. of Geography and Territorial Planning, U. of Zaragoza); Arnéz Vadillo (Dept. of Physical Geography, U. of La Rioja); Asensio Amor, Pérez González (CSIC); González Martín, Agudo Garrido, Amuchastegui (Dept. of Geography, U. Autonoma).

#### 5. The Cantabrian Mountain System

Universities of Oviedo and Cantabria. Researchers: Castañón Alvarez (Dept. of Geography, U. of Oviedo); Frochoso Sánchez, Serrano Cañadas (Dept. of Geography, Urbanization and Territorial Planning, U. of Cantabria).

#### 6. Galician Massifs

University of Santiago de Compostela, the Xeolxico Laboratory of Laxe. Researchers: Pérez Alberti, Martínez Cortizas, Moares Domínguez (Dept. of Geogra-

phy, U. of Santiago Comp.); Vidal Romaní (Xeolxico Lab. of Laxe).

#### 7. Teide Volcano (The Canary Islands)

La Laguna University and the Autonomous University of Madrid. Researchers: Martínez de Pisón, Quirantes, Criado, Romero (Depts. of Geography, La Laguna, Aut. U. of Madrid).

Since 1987, Spanish researchers have been involved in additional programs abroad. Subjects related to recent glacial evolution and forms associated with ground ice in particular areas in Patagonia, Tierra del Fuego, Peruvian Andes, Nanga Parbat in the Himalayas, Mexico's stratovolcanoes, and Antarctica have been studied. Geographical areas and research teams are:

##### *Patagonia*

Autonomous University of Madrid. Researchers: Martínez de Pisón (Dept. of Geography).

##### *Tierra Del Fuego*

University of Barcelona. Researchers: Serrat Congost (Dept. of Dynamic Geology, Geophysics and Paleontology).

##### *Peruvian Andes and Nanga Parbat (Himalayas)*

Autonomous University of Madrid. Researchers: Martínez de Pisón, Nicolas Martínez, López Martínez (Depts. of Geology and Geography).



View to the south from Port d'Envalira, Andorra (elev. 2,407 m or 7,897 ft) of eastern end of Pyrenees Mountains illustrating ancient cirques, modern and Pleistocene talus slopes, and poorly developed rock glaciers in sharp peaks of crystalline rock. Peaks in central Pyrenees include the highest points (3,404 m or 11,169 ft). (Photograph No. PK 27,676 by Troy L. Péwé, 29 Sept 1985.)

### *Mexico's Stratovolcanoes*

Autonomous Universities of Madrid and of Mexico. Researchers: Palacios (Dept. of Regional Geographic Analysis and Physical Geography, U. Complutense).

The most important studies into cold regions outside of Spain are being carried out in the Antarctic (South Shetland Island and the Antarctic Peninsula) within the context of the National Antarctic Program established by the Spanish Government in the National Plan for Scientific Research and Technological Development. The Departments of Geology and Geography of different Spanish universities and the CSIC represent the complex investigations of the environment in these regions of the Earth (researchers: Acaso, Arche, del Barrio, Escribano, Calvet Porta, Cañadas, Corbera, Criado, Diez Moñux, Lopez Martínez, Martínez de Pisón, Ramos, Sainz, Serrano, Serrat, Vilaplana). The objects of the different programs being undertaken are:

- Identification and mapping of glaciers as well as the study of their typology and morphology
- Geomorphologic evolution of glacial snouts—the fluctuation of the glacial cover and the dynamic of glacial flow
- Quaternary morphovolcanic evolution of the Isla Decepción
- Dating of recent and present glacial events and of variations in sea level
- Present micrometeorologic and geomorphologic processes in the active soil cover in deglaciated areas
- Ecology of frozen ground
- Snow hydrology

Many results have been published in the specialized literature.

## Sweden

Within the project “Monitoring of permafrost and periglacial processes and their climatic controls at Kapp Linn, Svalbard,” a new and expanded permafrost monitoring station has been established. It is operated by the Geomorphological Research Group at the Department of Physical Geography, Lund University, headed by Prof. H. Jonas Åkerman. In addition to four old 3- to 6-m-deep temperature profiles which have been operating since 1973, the station has a new 10-m-deep temperature profile that was drilled in 1992 and is equipped with modern loggers to monitor air, active layer and permafrost temperatures.

Twenty-four years of continuous monitoring of periglacial processes has created a unique data set from a

representative arctic periglacial environment where there is good macro- and micro-climatic control. Climatic data covering the period from 1912 are available for Kapp Linn. Solifluction, physical and chemical weathering, debris flows, patterned ground formation, ground ice formation, wind abrasion and thermokarst processes, and their rates, magnitudes, frequencies, variations and trends will be analyzed in relation to climatic variables. Annual, seasonal and monthly data are available for these processes. Analysis of the possible use of permafrost and periglacial processes as indicators of climatic and environmental variations and changes will be performed within the framework of the project.

The IGU Commission on Geomorphic Responses to Environmental Change (GERTEC) held a conference on Arctic and Alpine Geomorphology and Environmental Change, 29 August–5 September at the Abisko Research Station, Abisko, Sweden. Local organizers were Prof. A. Rapp and P. Schlyter. The conference was attended by more than 20 scientists from the United Kingdom, Canada, France, Israel, the Netherlands, Norway, Poland, Switzerland, Sweden and the United States. Papers on field studies were in the majority (e.g. M.-F. André, Geomorphic impact of infrequent events on alpine slopes—Examples from Svalbard; J. Dixon, R. Darmody, P. Schlyter and C.E. Thorn: Geochemical process responses to environmental change in the mountains of northern Scandinavia; N. Caine: Temporal variations in the quality of streamwater in an alpine environment, Green Lakes Valley, Colorado Front Range, USA; A. Rapp: Environmental change in North Scandinavian mountains). A number of experimental and modeling papers were also presented (e.g. R. Bryan: Soil erosion response to small-scale climatic change; M. Kirkby: Evaluating the erosional impact of global change—A methodology; E. Parlow: The importance of satellite imagery and heat budget modelling for geomorphological studies in polar areas). The conference papers will be published in a forthcoming special issue of *Geografiska Annaler* edited by M.-F. André and A. Rapp.

Submitted by H.J. Åkerman

## Switzerland

An extensive field study was completed by E. Gerber (Geographical Institute, University of Freiburg) on glacier/permafrost interaction and the development of corresponding sediment complexes in the Lona-Sasseneire region (Wallis Alps). The combined application of geomorphological field mapping, geophys-

ical soundings, hydrological tracer experiments and cartographic analyses allowed the documentation of almost complete disappearance since the last century of a small alpine glacier and the patchy distribution of slowly creeping permafrost. Clear indications of thaw settlement could be found in the permafrost areas since 1971.

Geophysical prospecting methods for mountain permafrost were systematically tested and analyzed by D. Vonder Mhll (VAW/ETH Zrich). Seismic refraction, D.C. resistivity, georadar, gravimetry, VLF-R measurements, and borehole logging confirm the ice-supersaturated condition of most perennially frozen debris occurrences in the Alps. These include the active rock glaciers Murtorvatsch, Muragl, Suvretta and Pontresina/Schafberg, where especially detailed investigations were carried out. The combination of high ice contents and near 0°C permafrost temperature leads the alpine permafrost to be highly sensitive to warming and thaw destabilization.

Snow/permafrost interaction under alpine conditions was investigated by Keller (VAW/ETH Zrich) in the area of the Murtorvatsch borehole. Information is now available on characteristic values of density, temperature, temperature gradient, vertical heat flow, thermal resistance, hardness, ram resistance, stratigraphy, grain size and grain shape within the winter snow cover at sites with and without permafrost. Snow metamorphosis and the date of spring runoff are markedly affected by the presence or absence of alpine permafrost. Autumn snow conditions, on the other hand, exert an important influence on permafrost conditions.

M. Hoelzle (VAW/ETH Zrich) estimated permafrost distribution patterns for a test area (Corvatsch-Furtschellas) and for the whole Upper Engadin region (Eastern Swiss Alps) using a relation among permafrost occurrence as indicated by BTS measurements, potential direct solar radiation, and mean annual air temperature. Based on these model studies and for the time period since 1850, permafrost became inactive or disappeared in about 15% of the area originally underlain by permafrost in the whole Upper Engadin region. The estimated loss in glacier volume since 1850 lies between 55% and 66% of the original value. With an assumed increase in mean annual air temperature of +3°C, the area of supposed permafrost occurrence would possibly be reduced by about 65% with respect to present-day conditions and only three glaciers would continue to exist.

Numerical model experiments coupling glaciers with nonconsolidated sediment beds, groundwater and permafrost were completed by Chr. Speck (VAW/ETH

Zrich) with respect to Pleistocene ice conditions on the Swiss Plateau. Strongly simplified boundary conditions still limit the quantitative local applicability of the results. It becomes evident, however, that the glacier front induces a special hydraulic/thermal condition by imposing steep hydraulic gradients onto the bed and, hence, by forcing deep groundwater circulation to drastically influence ground temperatures at great depth. Beyond palaeoglaciological considerations, the dependence of ice and groundwater in cold regions on climatic conditions is of increasing interest in view of atmospheric warming trends.

Crystallographic and isotopic analyses (<sup>2</sup>H, D<sup>18</sup>O) are being carried out by the Physics Institute at the University of Bern, the Institute of Environmental Physics, University of Heidelberg, Laboratoire de Gomorphologie, Universit Libre de Bruxelles on material of the permafrost core from Murt-Corvatsch rock glacier. Temperatures in the corresponding borehole continue to rise at a high rate. This development may soon allow for analysis of permafrost creep rates as a function of variable temperature but constant stress. Various stability problems (summit station of Gemsstock cable car, debris flows from permafrost in the Zermatt valley) are being dealt with by commercial agencies and/or by the Swiss National Research Programme on Climate Change and Natural Catastrophes.

Investigation of permafrost creep and rock glaciers in northwest Svalbard was continued by VAW/ETH Zrich as a collaborative effort together with the Geographical Institute of the University of Oslo. Seismic refraction soundings (St. Wagner, 1993) and gravimetric measurements (D. Vonder Mhll, 1994) were carried out in order to determine the geometry and ice content of small rock glaciers near Brggerbreen and on Kvadehukken (Ny Alesund).

Submitted by W. Haerberli

## United States

The IPA Secretariat has received a five-year grant from the National Science Foundation. The award was made in September to the American Geophysical Union (AGU), which will serve as the host organization. The grant provides administrative and travel support for the Secretary General and for some activities of the Executive Committee. This award will help foster international cooperation in both hemispheres and facilitate implementation of international projects of interest to the permafrost communities.

The AGU is a major scientific professional organization established in 1919 to initiate, promote, and participate in geophysical research programs, including those that depend upon international cooperation. It has a membership of over 31,000 worldwide and convenes annual meetings in the spring and fall of each year. It has a standing committee for Snow, Ice and Permafrost. Bernard Hallet currently represents our permafrost interests on the committee. To initiate AGU/IPA cooperation, a special session of the Fall 1994 Annual Meeting in San Francisco was held with the theme "Frozen Ground and Changing Climate" (see p. 8). A 1995 session is also planned. AGU has long had an interest in permafrost, having published some of the early landmark papers in its *Journal of Geophysical Research*. In addition to JGR, it publishes the journals *Water Resources Research*, *Reviews of Geophysics*, *Geophysical Research Letters*, *Radio Science*, *Tectonics*, *Paleoceanography*, *Global Biogeochemical Cycles*, *Earth in Space* and the weekly news journal *Eos*. More information about the AGU and IPA activities can be obtained from Caroline J. Gilman, Program Associate, who is assisting Jerry Brown in IPA administrative activities: AGU, 2000 Florida Avenue NW, Washington, D.C. 20009 (Tel: 202 462 6910, Ext 213; Fax: 202 328 0566; E-mail: cgilman@kosmos.agu.org).

In order to promote IPA interests and coordination, the Association of American Geographers (AAG) is considering establishing a specialty group with emphasis on permafrost and periglacial environments. This will be discussed at the AAG annual meeting in Chicago, 14–18 March 1995. For more information about the organization of the specialty group contact H. Jesse Walker, Department of Geography, Louisiana State University, Baton Rouge, Louisiana 70803 (Fax: 504 388 2192). The AAG is a scholarly non-profit organization founded in 1904 to advance professional studies in geography and to encourage the application of geographic research in education, government and business. Membership consists of approximately 6700 individuals, 94 institutions and 11 corporations, primarily from the US and Canada. For more information on activities, publications and membership, contact AAG, 1710 16th Street NW, Washington, D.C. 20009-3198 (Fax: 202 234 2744).

The Arctic Research Commission, at its December 1994 meeting, discussed new engineering research initiatives focused on arctic housing, sewage disposal and potable water systems in Alaskan villages. Plans are being made to convene a workshop in March 1995 involving government agencies and groups interested in these problems. For more information, contact Lyle Perrigo at 707A Street, Anchorage, Alaska 99501 (Fax: 907 276 6847).

The National Snow and Ice Data Center, University of Colorado, recently released a CD-ROM on arctic data. The CD-ROM was constructed for the NSF-sponsored Arctic System Science Land–Atmosphere–Ice Interactions (ARCSS/LAII) research initiative. It contains soils, climate, hydrography, vegetation, and GIS data for the North Slope area of Alaska. For more information, contact NSIDC (Tel: 303 492 6199; Fax: 303 492 2468).

Steve Arcone, Alan Delaney and Dan Lawson of CRREL are utilizing ground-penetrating radar (GPR) to delineate the bottom as well as upper surfaces of permafrost and analyze the 3-D distribution of unfrozen aquifers within which contaminant transport may be taking place. They are applying GPR to profile permafrost and evaluate ground water flow patterns within the permafrost terrain north of the Chena River in interior Alaska.

Keith Kvenvolden, Tom Lorenson (U.S. Geological Survey) and Valerie Barber (University of Alaska, Fairbanks) report the completion of a study of methane in the Fox permafrost tunnel near Fairbanks, Alaska. Methane was measured in the tunnel air and in selected samples of ice and frozen silt cored from the walls of the tunnel. The methane content of the tunnel air was measured between 1990 and 1993 and was found to be 2.5 to 20 times that of the outside air. During the sublimation process, methane is released from the permafrost. Carbon isotopic compositions indicate that the methane results from the microbial decomposition of organic sediments. Complete results of this study will appear in U.S. Geological Survey Bulletin 2107.

US investigators are urged to submit notes on current activities.

Compiled by J. Brown

## OTHER NEWS

### **International Commission on Snow and Ice (ICSI)**

The primary task of the commission is participation in a number of international programmes such as the International Geosphere-Biosphere Programme, the fourth phase of the International Hydrological Programme and the World Climate Programme.

The working group on Snow Chemistry published a monograph on this topic. A new working group was established on Snow Ecology. Its activities include a contribution to the evaluation of the impact of global change on fauna and flora at high latitudes. Another new working group on Snow/Atmosphere Chemical Exchange focuses on processes at Summit (Greenland) in connection with the interpretation of the deep GISP2 and GRIP ice cores.

An important ICSI contribution to the International Hydrological Programme is preparation of the World Atlas of Snow and Ice Resources in Moscow. A technical report on the variation of snow and ice covers at global and regional scales is being prepared by ICSI bureau members on behalf of UNESCO.

Submitted by W. Haeberli

### **World Glacier Monitoring Service (WGMS)**

Worldwide coordination of long-term glacier monitoring started exactly 100 years ago when, in 1894, the Sixth International Geological Congress at Zurich established an International Glacier Commission. The goals of this program were defined by Forel of Geneva, the first president of the commission, in a remarkable article entitled "Les Variations Périodiques des Glaciers. Discours Préliminaire" (*Archives des Sciences Physiques et Naturelles*, Geneva, vol. 34, p. 209–229). In connection with this historical benchmark, a report is now being prepared for the UNESCO/IHPSRH series with the provisional title "Into the 2nd Century of World Glacier Monitoring: Prospects and Strategies." The document aims at reviewing and (where necessary) redesigning the basic strategy of the program in view of future problems, especially regarding potential greenhouse warming and global water resources.

The World Glacier Monitoring Service has prepared a pilot study of the European Alps that employs glacier inventory data to estimate the characteristics of and regional climate change effects on mountain glaciers.

Total glacier volume in the Alps is estimated at some 130 km<sup>3</sup> for the mid-1970s; strongly negative mass balances have caused the loss of about 10% to 20% of this volume during the decade 1980–1990. Backward calculation of glacier length changes using a mean annual mass balance of –0.25 m water equivalent per year since the end of the Little Ice Age in central Europe (around 1850 AD) gives considerable scatter but satisfactory overall results as compared with long-term observations. The total loss in alpine glacier mass since 1850 can be estimated at about half the original value. An acceleration of this development, with annual mass losses of around 1 m/yr or more, as anticipated from scenario A of the Intergovernmental Panel on Climate Change for the coming century could eliminate major parts of the presently existing Alpine ice volume within decades.

It is planned to go through similar analyses for all available detailed glacier inventories while incorporating them into the new data bank and to check the databases in cooperation with the responsible national correspondents of WGMS. *Glacier Mass Balance Bulletin* No. 3 (1992/93) is being prepared for printing in winter 1994/95. Preliminary analysis of the information indicates that average mass balance was strikingly less negative in 1993 than for other recent years. It will be interesting to investigate whether this preliminary impression can be confirmed and, indeed, is a global (short-term) signal.

Submitted by W. Haeberli

### **15th Polar Libraries Colloquy**

The 15th Polar Libraries Colloquy met for six days at Girton College, Cambridge, England, in July 1994. Most of the 88 participants, representing 16 countries, were librarians or archivists, but the group also included historians, natural scientists, and data managers. The countries represented were all circumpolar or had strong traditions of polar research; three Southern Hemisphere countries were represented.

The theme of the conference was Bi-Polar Information Initiatives: The Needs of Polar Research. The conference was organized into five thematic sessions, with a total of 39 oral presentations and a poster session with 18 posters. The opening address was given by John Heap, Director of the Scott Polar Research Institute; David Drewry, Director of the British Antarctic Survey, also addressed the colloquy.

A proceedings volume, including the contributed versions of the oral and poster presentations, is being prepared. The 16th Polar Libraries Colloquy will be held in Alaska in 1996.

The IPA was well represented at the colloquy. Jerry Brown and Alan Heginbottom both made oral presentations. Nikolai Romanovskii presented a poster, co-authored with Robert van Everdingen; van Everdingen presented a second poster, co-authored with Heginbottom. In addition, Cheng Guodong, IPA President, attended the conference, as did Roger Barry, chairman of the IPA Data and Information Working Group.

As part of an IPA initiative to improve contacts between organizations with similar interests, Alan Heginbottom made a presentation at the colloquy business meeting, proposing a liaison between the IPA and the PLC. This will be carried out mainly by means of an E-mail bulletin board set up by the polar librarians, to which interested persons may subscribe. For details, contact Eric Tull, University of Calgary Library (E-mail: tull@acs.ucalgary.ca). More general information on polar matters is also available on an E-mail board at the University of Guelph, Guelph, Ontario, Canada; the contact is Peter Kevan (E-mail: pkevan@uoguelph.ca).

Submitted by J.A. Heginbottom

### **Second International Conference on Arctic Margins**

The Second ICAM was convened in Magadan, Russia, 6–10 September 1994. The meeting, hosted by the North East Science Center of the Russian Academy of Sciences and the University of Alaska Geophysical Institute, provided a forum for the exchange and presentation of new information on the earth sciences of the Arctic.

One-hundred-forty people registered for the conference; 64 were from eight countries outside of Russia: USA (47), Canada (8), UK (3), Colombia, Spain, The Netherlands, Japan, South Korea, and Germany (1 each). There were 105 oral presentations given, 45 posters displayed, and 270 abstracts published. Unfortunately, many Russians from outside of Magadan were not able to attend because of lack of funding for travel.

The scientific program consisted of the following sections with associated symposia: Stratigraphy and Biostratigraphic Correlation, with symposia on Cretaceous Volcanic Belts of the Arctic Segment of the Circum-Pacific and Beringian Province of Late Ceno-

zoic Basic and Ultrabasic Alkaline Volcanism; Paleoclimate and Paleogeography of the Arctic with a symposium on Late Cenozoic History of Beringia: New Developments; Regional Terrane and Paleobasin Correlation, with a symposium on Mantled Gneiss Domes, Metamorphic Core Complexes, and Granitic Core Metamorphic Domes; Regional Geophysics, Dynamics of the Lithosphere, and Seismology; Resource Potential—Minerals: Metallogeny of the Eastern Arctic; Resource Potential—Hydrocarbons; Permafrost, Engineering Geology and Mining Ecology; and a special session on the Proposed U.S.–Russia Simultaneous Oil and Gas Lease Sale in the Chukchi Sea.

The abstract volume is available for purchase from the North East Science Center in Magadan, and a proceedings volume containing selected papers will be published next year. The proceedings of the 1992 ICAM have been published and are available free from co-editor Dennis Thurston, Minerals Management Service, 949 E. 36th Street, Anchorage, Alaska 99508-4302.

The Third ICAM is tentatively scheduled to be held in Calgary in late 1996 or early 1997.

Submitted by D. Thurston and  
K. Simakov, Conference co-chairs

### **IGCP Project 385—Problematic Permafrost Landforms: Kurums and the Palsa Complex**

The proposal for this project is under review by the UNESCO Scientific Board. The proposer is Professor S.A. Harris, University of Calgary. The program of work consists of:

1. 20–27 August 1995: Workshop at Abisko, Sweden, to study palsas and pingo-like features in northern Sweden, Norway, and Finland (see Calendar). Leader: Professor Jonas Åkerman.
2. August 1996: Kuujuaapik, northern Quebec, to study palsas and peat plateaus in a lowland area of degrading permafrost. Leader: Professor Michel Allard.
3. August 1997: Southern Yukon, to study palsas and peat plateaus in an alpine area of stable permafrost. Leader: Professor S.A. Harris.
4. August 1998: Kurums of the Trans Baikal region. Leader: Professor N.N. Romanovskii.
5. July–August 1999: Rock glaciers in the Tien Shan, Kazakhstan. Leader: Professor A. Gorbunov.

The August 1995 workshop will be based at the Abisko Research Station. The trip will start and end at

Kiruna, Sweden, and there will be field visits to sites in Norway, Finland and Sweden. Landforms to be examined include intact and collapsed pingo-like features, palsas, peat plateaus, and other permafrost mounds. There will be detailed field demonstrations as well as three half-day paper seminars at Abisko. Cost will not exceed US \$1200. APEX air fare Stockholm to Kiruna return is about US \$300. For further details, contact Professor H. Jonas Åkerman, Department of Physical Geography, Lund University, Solvegatan 13, S 222362, Lund, Sweden (Fax: 46 46 104417; Tel: 46 46 108693; E-mail: jonas.akerman@natgeo.lu.se).

Submitted by S.A. Harris

### **IGCP Project 253—Termination of the Pleistocene**

IGCP 253, approved by the IGCP Board in Paris in 1990, ended in 1994. The basic idea behind it was a careful study of different aspects of the environmental changes that took place between 18,000 and 8,000 BP over the entire Earth.

The work was done by nine working groups, one of which dealt with changes in permafrost conditions. This working group concentrated on glaciation-permafrost interaction in North America and north-west Siberia. In North America, except the areas which were not glaciated during the Late-Wisconsinan glacial maximum, all present-day permafrost is considered to be late glacial to post glacial in age. Glaciation-deglaciation and permafrost development in West Siberia are still subjects of differing opinion. According to Grosswald, the Late Weichselian ice sheet formed separate domes over the Barents Sea and Kara Sea continental shelf which acted as centers of ice dispersion, resulting in the southward movement of the ice from the Taimyr Peninsula shortly after 20,000 BP. However, Astakhov reaches the conclusion that in this area glaciation reached its maximum not in the Late Weichselian, but most probably in the Early or Middle Weichselian. This concept was supported by evidence which, during this project, was derived from the widespread buried glacier ice and surrounding sedimentary complexes in the northern part of West Siberia.

The final report of IGCP 253 will synthesize the principal results of all the working groups. It will be published in a special volume of the *Quaternary International* in early 1995, together with the reports of all working groups and a selection of short individual papers as contributions to the Project Report. The first drafts of working group reports and also the project report were discussed at Lammi Field Station in Fin-

land on 24–27 October 1994. The report of the Working Group on Changes in Permafrost Conditions was prepared by R. Vaikmae, together with M. Boese, F.A. Michel and B.J. Moormann. Papers by V. Astakhov, M. Boese and S.A. Harris will be published separately as a contribution to the report.

Together with N. Rutter and J. Teller, we plan to prepare a proposal to the IGCP Board for a new project dealing with problematic ice sheets, permafrost and ice-dammed lakes in Siberia. This proposal will be discussed during the 1995 INQUA Congress.

Submitted by R. Vaikmäe

### **International Arctic Science Committee**

The Global Change Programme Office (GCPO) of the International Arctic Science Committee (IASC) is located at the Arctic Center, Rovaniemi, Finland, under the direction of Manfred Lange. The IASC Working Group on Global Change met in Stockholm, Sweden, on 5–7 October to plan future activities. A major focus of the IASC Global Change Research Programme is regional cumulative impact. Several IASC meetings will consider this and related topics: Disturbance and Recovery in September 1995 in Rovaniemi, and the International Conference for Arctic Research Planning in December 1995 in Hanover, New Hampshire, USA (see p. 30 for contacts). Permafrost will be discussed in both, and IPA plans to contribute to these discussions. For more information on IASC and its activities contact Dr. Odd Rogne, IASC Secretariat, PO Box 5072 Majorstua, 0301 Oslo, Norway (Fax: 47 22 959601; E-mail: iasc@npolar.no). Or contact the Global Change Programme Office in Rovaniemi, Finland (Fax: 35 86 0324 760; E-mail: iascgcpo@levi.urova.fi).

### **IUGS COGEOENVIRONMENT Workshop**

Geological indicators of rapid environmental change were reviewed at an international workshop held 11–17 July 1994 at Grenfell College, Corner Brook, Newfoundland, and at the nearby Gros Morne National Park. The meeting was organized by COGEOENVIRONMENT, the Commission on Geological Sciences for Environmental Planning of the International Union of Geological Sciences under the direction of Chairman of the working group on Geo-indicators A.R. Berger, Victoria, B.C., Canada.

The aims of the workshop were:

- To review and refine international guidelines for and checklists of geo-indicators to be used in interdisciplinary monitoring and research

- To identify both gaps in knowledge and opportunities for geoscience contributions to environmental monitoring and global change research
- To produce material for an annotated checklist and eventual monograph on geo-indicators for use in long-term environmental and ecological monitoring and state-of-the-environment reporting.

It was agreed after much debate that geo-indicators are measures of magnitudes, frequencies, rates and trends of geological processes or phenomena operating or occurring over periods of 100 years or less, at or near the Earth's surface, that are subject to variations of significance for assessing rapid environmental change. Geo-indicators measure both catastrophic events and those evident within a human lifespan that are important for understanding environmental change.

IPA Vice President Nikolai Romanovskii participated and presented co-authored review papers on kurum, naleds, and slope failures. Review papers presented will be published in a volume based on the workshop proceedings. Further information may be obtained from A.R. Berger, Chairman, Geo-indicators Working Group, 528 Paradise Street, Victoria, British Columbia, Canada V9A 5E2 (Fax: 604 480 0840).

Modified from a report by A.R. Berger

### International Geographical Union

The IGU Executive Board met in Prague, Czechoslovakia in August 1994 during an IGU regional conference. Discussions were held on how IPA and IGU can organize closer cooperation. Opportunities could include joint working group activities, convening joint sessions, and conducting joint field trips such as those planned with the International Association of Geomorphologists at its IV International Geomorphology Conference to be held in Bologna, Italy, 28 August–3 September 1997. Closer organizational relationships will be discussed at the 1995 IPA Council meeting, at the IAG meeting in Singapore in June 1995, and at the IGU General Assembly in The Hague, August 1996.

Submitted by H.J. Walker

### CLIMEX: Climatic Extremes of the Past

The first meeting of CLIMEX was held at Cassi and Luminy, France, 15–19 October 1994. The project is under the auspices of UNESCO and the International Union of Geological Sciences. Three maps are planned at the same 1:25,000,000 scale as the Geological Map of the World (CGMW): 1) the Last Glacial Maximum (18,000 ±2000), 2) warm optimum (ca. 7000) and 3) present. The following will be shown: coastlines, ice extent, permafrost–periglacial conditions, SST, tropical deserts, mangroves and biomes. The project coordinator is Nicole Petit-Maire. Nikolai Romanovskii and his colleagues plan to develop much of the paleo-permafrost information. The next CLIMEX meeting is planned for 6–7 June 1995 in the Canary Islands and compiled maps should be available for the 30th International Geological Congress in Beijing, August 1996.

Submitted by N. Petit-Maire

### Kazakhstan

I.V. Seversky and A.P. Gorbunov, International Centre of Geocology of the Mountain Countries in Arid Regions (ICGM) in Almaty, Kazakhstan, inform us of the following groups within ICGM:

1. I.V. Seversky, Head of ICGM: Snow avalanches, snow cover in the mountains and its influence on ground freezing.
2. A.P. Gorbunov: Alpine permafrost, rock glaciers, cryogenic relief.
3. P.A. Cherkasov, Head of the Laboratory of Glaciology: Glaciers, alpine climate, rock glaciers.
4. V.P. Blagovechensky, Head of Laboratory of Snow Cover and Avalanches: Snow cover and avalanches, alpine climatology.
5. E.V. Seversky, Head of the Laboratory of Geocryology: Seasonal freezing, permafrost mapping, cryogenic relief.
6. S.N. Titkov. Rock glaciers, alpine permafrost.

The mailing address is Institute of Geography, 99 Pushkin St., Almaty, 480 100, Republic of Kazakhstan (Fax: 7 3272 63 69 73 or 63 12 07, subscriber 132).

## PUBLICATIONS

### Geocryological Glossary Геокриологический Словарь 冻土学辞典

(汉、英、俄对照)

*Geocryological Glossary: Chinese–Russian–English, 1994* (Qiu Guoqing, Liu Jinren and Liu Hongxu, Ed.). The glossary contains over 600 terms and phrases in common use and should be of assistance to editors, librarians and translators. Contact Qiu Guoqing, Lanzhou Institute of Glaciology and Geocryology, 730 000 Lanzhou, China (see LIGG for Fax and E-mail, p. 31). Price \$15.00, including postage.

*Proceedings of the Second Symposium on Joint Siberian Permafrost Studies Between Japan and Russia in 1993, Tsukuba, 12–13 January 1994*, edited by Gen Inoue. Isebu, 2-11-20, Amakubo, Tsukuba, Ibaraki, 305 Japan.

*Progress in Natural Science*, Changxu Shi, Editor-in-Chief, Taylor & Francis, Rankine Road, Basingstoke, Hampshire RG24 9PR, UK. \$170 U.S. (£95).

The National Natural Science Foundation of China (NSFC) entrusted by the State Planning Commission started publication of a journal to review the research achievements of State Key Laboratories of China in 1991 with a prerequisite that it should be a comprehensive academic nature journal of high standards. The journal is entitled *Progress in Natural Science—Communication from State Key Laboratories of China*, and it is published bimonthly in both Chinese and English. The journal has four sections: the first covers review articles, refereed summary reports of the academic achievements in a specific field acquired by a scientist or a group of scientists of a laboratory; the second scientific papers; the third research notes and letters; the last a brief introduction to the State Key Laboratories. Qualified papers from laboratories other than SKL are also welcome. The journal is distributed to 56 countries and regions all over the world by the scientific publisher Taylor & Francis based in London.

# 冰川冻土

## Journal of Glaciology and Geocryology

Selected Frozen Ground Titles

### Volume 16, No. 1 (March 1994)

*New Progress on the Glaciological and Quaternary Glaciation Research in China Since the 1980s*, Shi Yafeng and Li Jijun

*Strength Characteristics of Frozen Sandy Soil*, Wu Ziwang, Ma Wei, Zhang Changqing et al.

*Approximate Calculating Method of Some Design Parameters in Drilling Shaft of Artificial Freezing*, Li Shuxun

*The Climate Feature at the Tanggula Mountain Pass on the Centre of Tibetan Plateau*, Zhang Yinsheng, Pu Jianchen and T. Ohate

*Quaternary Glaciation on the West Slope of Mt. Gongga*, Ma Qihua

*Permafrost and Climate in Future*, В.В. Баулин et al.

*A Study of Environmental Development of Forest Covered Frozen Soil Region on Mt. Maxian Near Lanzhou*, Song Wenxu and Zhang Xiumei

*On Comparison of Chinese Geocryological Terms with English and Russian*, Liu Jingren and Qiu Guoqing

### Volume 16, No. 2 (June 1994)

*The Responses of Vegetation on Northern Part of Mt. Daxinganling to Strongly Enforced Permafrost Environment and Environmental Disturbances*, Zhang Qibing

*An Experimental and Theoretical Investigation on the Cutting Resistance of Frozen Soil*, Zhang Zhaoxiang and Yu Qun

*Creep and Creep Strength of Frozen Soil*, Ma Wei, Wu Ziwang and Sheng Yu

*Research on the Formation and Evolution, the Environment Change and the Ecological System of the Qinghai–Xizang (Tibet) Plateau*, Li Shijie

### Volume 16, No. 3 (September 1994)

*The State of the Art on Description and Classification of Frozen Soils and Some Suggestions*, Xu Xiaozu

*Application of the Radial-Splitting Method to Determining Tensile Strength of Frozen Soil*, Shen Zhongyan, Liu Yongzhi and Peng Wanwei et al.

*A Study of Naturally Thawing and Digging Method of Gold Mining in Seasonal Frozen Ground*, Gao Min, Tong Boliang and Lin Jinfang et al.

*A Study on the Spatial Overlaying Relationship Between Winter Snow Cover and Vegetal Cover in Xilin Gola Steppe of Inner Mongolia by Using Remote Sensing Data*, Yong Shipeng, Tong Chuan and Yong Weiyi et al.

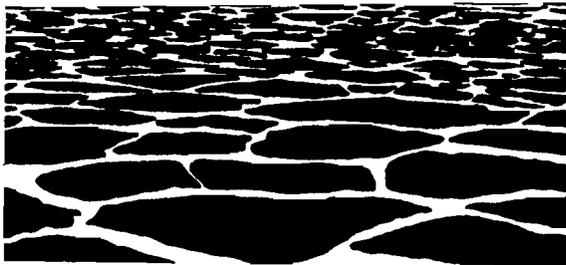
*Experimental Researches on Salt Heaving of Sulphate-Treated Soil with Different Dry Densities*, Fei Xueliang, Li Bin and Wang Jiacheng

*The Changing Characteristics of Hydraulic Diffusivity in Unsaturated Soil*, Deng Yousheng and Xu Xiaozu

*Void Properties of Till from the Altay Mountains and the Tianshan Mountains, Xinjiang, China*, Yi Chaolu and Cui Zhijiu

*Response of Cryosphere to Global Warming and Reduced Rise in Sea Level*, Li Peiji

*The Applications of Ground-Probing Radar to Geological Investigation on Ground in Cold Regions*, Gu Zhongwei



## PERMAFROST AND PERIGLACIAL PROCESSES

### Volume 5, Issue No. 3 (July–September 1994)

*Periglacial Landforms at Giant's Castle, Natal Drakensberg, South Africa*, J.C. Boelhouwers

*Evidence for a Cyclic Variation of Permafrost Temperatures in Northern Alaska*, T.E. Osterkamp, T. Zhang and V.E. Romanovsky

*Glaciological Constraints on Protalus Rampart Development*, C.K. Ballantyne and D.I. Benn

*Structural Sédimentaires d'un Cône de Flots de Débris (Vars, Alpes Françaises, Méridionales)*, P. Bertran and J.-P. Texier

*Protalus Ramparts and Related Features Along the Niagara Escarpment, Niagara Peninsula, Ontario*, K.J. Tinkler and J.W. Pengelly

*Water Migration and Ice Segregation in the Transition Zone Between Thawed and Frozen Soil*, V.I. Solomatin and Xu Xiaozu

### Short Communication

*Changes in Hydrogeologic Regimes in Permafrost Regions Due to Climatic Change*, F.A. Michel and R.O. van Everdingen

### Volume 5, Issue No. 4. (October–December 1994)

*Ground Temperatures and Related Permafrost Characteristics in West Greenland*, F.G.M. van Tatenhove and O.B. Olesen

*Identification of Heat-Transfer Processes During Soil Cooling, Freezing and Thaw in Central Alaska*, K.M. Hinkel and S.I. Outcalt

*Sublimation as a Geomorphic Process—A Review*, J. Law

*Ice-Wedge Rejuvenation, Fosheim Peninsula, Ellesmere Island, Canada*, A.-G. Lewkowicz

*Ice-Wedge Casts and Relict Polygonal Patterned Ground in Northeast Iowa*, J.C. Walters

### Short Communications

*Snow Depth Controls Palsa Growth*, M. Seppala

*Burial Mound Permafrost in the Altani*, A. Gorbunov and I. Gorbunova

John Wiley and Sons, Ltd., publishers of *Permafrost and Periglacial Processes*, has agreed in principle to offer reduced individual subscription rates of approximately \$50.00 (U.S.) to those individuals who can demonstrate a professional interest in permafrost and other forms of frozen ground. Recipients of *Frozen Ground* and participants in the international permafrost and related periglacial conferences can qualify for this reduced subscription rate. Those interested in obtaining more information should contact: Subscriptions Department, John Wiley and Sons Ltd., Baffins Lane, Chichester, West Sussex, PO19 1UD, England.

## FORTHCOMING MEETINGS

1995

**74th Annual Meeting, Transportation Research Board  
Frost Action Committee**  
21–26 January 1995, Washington, D.C., USA  
Contact: TRB, National Research Council, 2101  
Constitution Avenue NW, Washington, D.C. 20418

**The 25th Arctic Workshop**  
16–18 March 1995, Université Laval, Québec, Canada  
Contact: Michel Allard, Centre d'Études Nordiques,  
Université Laval, St-Foy, Québec G1K 7P4, Canada  
E-mail: m.allard@cen.ulaval.ca

**International Tundra Experiment (ITEX) Sixth  
Workshop**  
8–11 April 1995, Ottawa, Canada  
Contact: Greg Henry, Department of Geography,  
University of British Columbia, Vancouver, British  
Columbia V6T 1Z2, Canada  
Tel: 1 604 822 2985; Fax: 1 604 822 6105  
E-mail: greg.henry@mtsg.ubc.ca

**Second International Conference on Mechanics of  
Jointed and Faulted Rocks (MJFR-2)**  
10–14 April 1995, Vienna, Austria  
Contact: H.P. Rossmann, Institute of Mechanics,  
Technical University Vienna, Wiedner Hauptstrasse  
8-10/135, A-1040 Vienna, Austria  
Tel: 43 1 58 801 5514 / 43 1 58 75863

**Scientific Council on Earth Cryology, Geocryology  
and Global Change**  
25–27 April 1995, Pushchino, Moscow Region, Russia  
Contact: Scientific Council on Earth Cryology, 11/15  
Fersman Str., Moscow, Russia  
Tel: 7 095 124 5355  
E-mail: gilichin@issp.serpukhov.su

**Southern African Palaeo- and Neo-Climates**  
26 April 1995, Cape Town, South Africa  
Contact: Mr. J. Boelhouwers, Department of Earth  
Sciences, University of the Western Cape, Private Bag X17,  
Bellville 7535, South Africa

**Les Sols Gelés: Processus Thermophysiques et  
Géomorphologiques**  
15–17 May 1995, Caen, France  
Contact: Colloque Franco-Canadien, Laboratoire  
d'Aérothermique, 4ter route des Gardes, 92190 Meudon,  
France  
Tel: 33 45 07 59 82; Fax: 33 45 07 58 20  
E-mail: cames@cnsr-belleveuve.fr  
or  
Colloque Franco-Canadien, Centre d'Études Nordiques,  
Université Laval, St-Foy, Québec G1K 7P4, Canada  
Tel: 1 418 656 3340; Fax: 1 418 656 2978  
E-mail: cen@cen.ulaval.ca

**Mountain Hydrology: Peaks and Valleys in Research  
and Applications**  
17–19 May 1995, Vancouver, British Columbia  
Contact: C. David Sellars, Klohn-Crippen Consultants Ltd.,  
10200 Shelbridge Way, Richmond, British Columbia  
V6X 2W7, Canada  
Tel: 1 604 279 4322; Fax: 1 604 279 4300

**International GEWEX Workshop on Cold-Season/  
Region Hydrometeorology**  
22–26 May 1995, Banff, Alberta, Canada  
Contact: Terry Krauss, National Hydrology Research Cen-  
tre, 11 Innovation Boulevard, Saskatoon, Saskatchewan  
S7N 3H5, Canada  
Tel: 1 306 975 4215; Fax: 1 306 975 5143  
E-mail: krausst@nhrrsv.nhrc.sk.doe.ca

**ISOPE-95: Fifth International Offshore and Polar  
Engineering Conference**  
11–16 June 1995, The Hague, The Netherlands  
Contact: P.O. Box 1107, Golden, Colorado 80402-1107  
Fax: 1 303 420 3760

**Southeast Asia Conference on Geomorphology**  
18–23 June 1995, Singapore  
Contact: K. Chuan, Division of Geography, Nanyang  
Technological University, 469 Bukit Timah Road,  
Singapore 1025  
Fax: 65 469 8433

**XIV International Union for Quaternary Research  
(INQUA) and IPA Council Meeting**  
3–10 August 1995, Berlin, Germany  
Contact: Congress Partner GMBH, Emmastr. 220, 28213  
Bremen, Germany  
Tel: 49 421 21 9073; Fax: 49 421 21 6419

**Global Change and Geography**  
14–18 August 1995, Moscow, Russia  
Contact: Secretariat, IGU '95, Staromonety 29, Moscow  
109017, Russia  
Fax: 7 095 230 2090  
E-mail: geography@glas.apc.org

**International Symposium on Glacial Erosion and  
Sedimentation**  
20–25 August 1995, Reykjavik, Iceland  
Contact: Secretary General, International Glaciological  
Society, Lensfield Road, Cambridge CB2 1ER, United  
Kingdom  
Tel: 44 223 355974; Fax: 44 223 336543

**19th International Congress of International  
Institute of Refrigeration (IIR) and Institut  
International Froid (IIF)**  
20–26 August 1995, The Hague, The Netherlands  
Contact: PR Group 19th Congress IIR/IIF 1995, c/o Den  
Daas/CM, P.O. Box 747, 3700 AS Zeist, The Netherlands

**International Conference on Past, Present, and  
Future Climate**

**22–25 August 1995, Helsinki, Finland**

Contact: SILMU, Academy of Finland, P.O. Box 57,  
FIN-00551, Helsinki, Finland  
Tel: 358 0 7748 8338; Fax: 358 0 7748 8299  
E-mail: silmu@aka.fi

**Disturbance and Recovery of Arctic Terrestrial  
Ecosystems**

**24–30 September 1995, Rovaniemi, Finland**

Contact: Secretariat, Arctic Centre, P.O. Box 122, FIN  
96101, Rovaniemi, Finland  
Tel: 358 60 324 754; Fax: 358 60 324 760  
E-mail: iascgcpo@levi.urova.fi

**48th Canadian Geotechnical Conference: Trends in  
Geotechnique**

**25–27 September 1995, Vancouver, British Columbia**

Contact: Bryan Watts, Klohn-Crippen Consultants Ltd,  
10200 Shelbridge Way, Richmond, British Columbia  
V6X 2W7, Canada  
Tel: 1 604 279 4325; Fax: 1 604 279 4300.

**International Conference for Arctic Research  
Planning**

**5–9 December 1995, Hanover, New Hampshire**

Contact: Oran R. Young, Director, Institute of Arctic Stud-  
ies, 6193 Murdough Center, Dartmouth College, Hanover,  
New Hampshire 03755  
Fax: 1 603 646 1279  
E-mail: oran.r.young@dartmouth.edu

**Monitoring of Permafrost and Frozen Soils:  
Implications for Studies of Periglacial Processes  
Under a Changing Climate (proposed)**

**American Geophysical Union Fall Meeting**

**11–15 December 1995, San Francisco, California**

Contact: Bernard Hallet, Quaternary Research Center,  
AK-60, University of Washington, Seattle, Washington  
98195  
Tel: 1 206 685 2409; Fax: 1 206 543 3836  
E-mail: hallet@u.washington.edu

**1996**

**75th Annual Meeting, Transportation Research Board  
Frost Action Committee**

**6–11 January 1996, Washington, D.C.**

Contact: TRB, National Research Council, 2101 Constitu-  
tion Avenue NW, Washington, D.C. 20418

**Second International Conference on Cryopedology  
June 1996, Syktyvkar, Russia**

Contact: David Gilichinsky, Institute of Soil Science and  
Photosynthesis, Pushchino, Moscow Region, Russia  
Tel: 7 095 923 1887  
E-mail: gilichin@issp.serpukhov.su

**8th International Cold Regions Engineering  
Conference**

**August 1996, Fairbanks, Alaska**

Contact: Larry Bennett, School of Engineering, University  
of Alaska, Fairbanks, Alaska 99775  
Tel: 1 907 474 6121; Fax: 1 907 474 6087

**30th International Geological Congress and  
IPA Executive Committee Meeting**

**4–14 August 1996, Beijing, China**

Contact: Professor Zhao Xun, 30th International Geologi-  
cal Congress, P.O. Box 823, Beijing 100037, China  
Tel: 86 1 8327772; Fax: 86 1 8328928

**1997**

**IV International Geomorphology Conference and  
IPA Executive Committee Meeting**

**28 August–3 September 1997, Bologna, Italy**

(Includes pre- and post-conference permafrost excursions)  
Contact: M. Panizza, Universita Degli Studi di Moden,  
59-41100 Modena, Italy  
Tel: 059 23 0394; Fax: 059 21 8326

**1998**

**Seventh International Conference on Permafrost and  
IPA Council Meeting**

**23–27 June 1998, Yellowknife, Canada**

Contact: J.A. Heginbottom, Geological Survey of  
Canada, 601 Booth Street, Ottawa, Ontario K1A 0E8,  
Canada  
Tel: 1 613 992 7813; Fax: 1 613 992 2468  
E-mail: heginbottom@gsc.emr.ca



# International Permafrost Association

December 1994

## Council

### Executive Committee

#### President

Prof. Cheng Guodong, Director  
Lanzhou Institute of Glaciology  
and Geocryology  
Chinese Academy of Sciences  
Lanzhou, 730 000  
China  
Tel: 86 931 882 6725  
Fax: 86 931 888 5241  
Telex: 72008 IGGAS CN  
E-mail: ggcheng@bepc2.ihep.ac.cn

#### Vice President

Dr. Hugh M. French  
Dean of Science  
University of Ottawa  
P.O. Box 450 Stn A  
Ottawa, Ontario K1N 6N5  
Canada  
Tel: 1 613 564 2407  
Fax: 1 613 564 5014  
E-mail:  
hfrench@science.uottawa.ca

#### Vice President

Prof. Nikolai N. Romanovskii  
Geocryology Department  
Faculty of Geology  
Moscow State University  
119899 Moscow  
Russia  
Tel: 7 095 939 1937 (office)  
Tel: 7 095 133 2668 (home)  
Fax: 7 095 233 4084  
E-mail: nromanovsky@glas.apc.org

#### Secretary General

Dr. Jerry Brown  
P.O. Box 9200  
Arlington, Virginia 22219-0200  
USA  
Tel/Fax: 1 703 525 3136  
E-mail: jerrybrown@igc.apc.org

### Members/National Contacts

#### Argentina

Dr. Arturo E. Corte  
Geociología, CRICYT  
Casilla de Correo 330  
5500 Mendoza  
Argentina  
Fax: 54 61 380370  
Tel: 54 61 241029  
E-mail: ntericyt@criba.edu.ar

#### Belgium

Dr. Albert Pissart  
Université de Liège  
Géomorphologie et Géologie  
du Quaternaire  
7, Place du 20 Août  
4000 Liège  
Belgium  
Fax: 3241224108

#### Canada

Mr. Don Hayley  
EBA Engineering Consultants Ltd.  
14535 118 Avenue  
Edmonton, Alberta T5L 2M7  
Canada  
Tel: 1 403 451 2121  
Fax: 1 403 454 5688  
E-mail: hayley@eba.ca

#### China

Professor Zhu Yuanlin  
Lanzhou Institute of Glaciology  
and Geocryology  
Chinese Academy of Sciences  
Lanzhou, 730 000  
China  
Tel: 86 26725 237  
Fax: 86 931 888 5241  
Telex: 72008 IGGAS CN  
E-mail: ggcheng@bepc2.ihep.ac.cn

#### Denmark

Sven Bertelsen  
Danish Society for Arctic  
Technology  
NN&R A/S  
Sortemosevej 2  
DK-3450 Allerød  
Denmark  
Tel: 45 48 14 0066  
Fax: 45 48 14 0033

#### Finland

Dr. Matti Seppälä  
Department of Geography  
University of Helsinki  
P.O. Box 9 (Siltavuorenpenger 20A)  
SF-00014 Helsinki  
Finland  
Tel: 358 0 1911  
Fax: 358 0 191 8670

#### France

Dr. Jaime Aguirre-Puente  
Centre de Géomorphologie  
CNRS (ERS F0079)  
24, rue des Tilleuls  
F-14000 Caen  
France  
Fax: 31 45 5757

#### Germany

Dr. Lorenz King  
Geographisches Institut  
Justus Liebig-Universität  
35394 Giessen  
Germany  
Tel: 49 641 702 8203  
Fax: 49 641 702 8211

#### Italy

Dr. Francesco Dramis  
Dipartimento di Scienze  
della Terra  
Università di Camerino  
Via Betti 1/a  
62032 Camerino  
Italy  
Tel: 39 737 40827  
Fax: 39 737 40839

#### Japan

Dr. Masami Fukuda  
Institute of Low Temperature  
Science  
Hokkaido University  
N19 W8 Sapporo 060  
Japan  
Fax: 81 11 706 7142  
E-mail:  
masami.fukuda@lt.hines.hokudai.ac.jp

#### Netherlands

Professor Eduard A. Koster  
Geographical Institute  
University of Utrecht  
P.O. Box 80.115  
3508TC Utrecht  
Netherlands  
Tel: 31 30 532044  
Fax: 31 30 540604

#### Norway

Dr. Kaare Flaate  
Norwegian Directorate of  
Public Roads  
P.O. Box 8142 DEP  
N-0033 Oslo  
Norway  
Tel: 47 22 073 900  
Fax: 47 22 073 444

#### Poland

Dr. Kazimierz Pekala  
Department of Geomorphology  
Maria-Curie Sklodowska Univ  
Akademicka 19  
20-033 Lublin  
Poland

#### Russia

Dr. Nikolai Grave, Secretary  
National Permafrost  
Committee  
Russian Academy of Sciences  
Fersman Street 11  
117312 Moscow  
Russia  
Tel: 095 292 6511  
Fax: 095 938 2097

#### Southern Africa

Mr. Wilson Rooy  
Treasurer/Secretary, SAPG  
University of the Western Cape  
Private Bag X17  
7535 Bellville  
South Africa  
Tel: 27 21 959 2299  
Fax: 27 21 959 2882

#### Spain

Dr. David E. Palacios  
Comite Español del IPA  
Departamento A.G.R. y  
Geografía Física  
Universidad Complutense  
28040 Madrid  
Spain  
Tel: 34 1 394 5955  
Fax: 34 1 394 5963

#### Sweden

Dr. H. Jonas Åkerman  
Department of Physical  
Geography  
University of Lund  
Soelvegatan 13  
S-23362 Lund  
Sweden  
Tel: 46 46 108693  
Fax: 46 46 104417  
E-mail: jonas.akerman@natgeo.lu.se

#### Switzerland

Dr. Wilfried Haeberli  
VAW/Glaciology  
Gloriastrasse 37/39  
ETH-Zentrum  
CH-8092, Zurich  
Switzerland  
Tel: 41 1 632 4093  
Fax: 41 1 632 1192  
E-mail: haeberli@vaw.ethz.ch

#### United Kingdom

Dr. Charles Harris  
Department of Geology  
University of Wales  
PO Box 914  
Cardiff, CF1 3YE  
United Kingdom  
Fax: 44 222 874326  
E-mail: sglch@cardiff.ac.uk

#### United States of America

Dr. C.W. Lovell  
School of Civil Engineering  
Purdue University  
West Lafayette, Indiana 47907  
USA  
Tel: 1 317 494 5034  
Fax: 1 317 496 1364  
E-mail: lovellc@ecn.purdue.edu

## Standing Committees

### Finance Committee

#### Chair

Mr. O.J. Ferrians, Jr.  
US Geological Survey  
4200 University Drive  
Anchorage, Alaska 99508  
USA  
Tel: 1 907 786 7427  
Fax: 1 907 786 7401

### Advisory Committee on Working Groups

#### Chair

Dr. C.W. Lovell  
School of Civil Engineering  
Purdue University  
West Lafayette, Indiana 47907  
USA  
Tel: 1 317 494 5034  
Fax: 1 317 494 1364  
E-mail: lovellc@ecn.purdue.edu

### Editorial Committee

#### Chair

Dr. Elisabeth Schmitt  
Geographisches Institut  
Justus Liebig Universität  
35394 Giessen  
Germany  
Fax: 49 641 702 8211

## Working Groups

### Data and Information

#### Chair: Dr. Roger Barry

World Data Center A: Glaciology  
Campus Box 449  
University of Colorado  
Boulder, Colorado 80309-0449  
USA  
Tel: 1 303 492 5171  
Fax: 1 303 492 2468  
E-mail: rbarry@kryos.colorado.edu

**Secretary:** Mr. J.A. Heginbottom  
Geological Survey of Canada  
601 Booth Street  
Ottawa, Ontario K1A 0E8  
Canada  
Tel: 1 613 992 7813  
Fax: 1 613 992 2468  
E-mail: heginbottom@gsc.emr.ca

### Terminology

#### Chair: Dr. Robert O. van Everdingen

2712 Chalice Road NW  
Calgary, Alberta T2L 1C8  
Canada  
Tel: 1 403 289 6823  
Fax: 1 403 282 4609  
E-mail: ervan@acs.ucalgary.ca

**Secretary:** Dr. Vyacheslav Konishchev  
Geography Faculty  
Moscow State University  
119899 Moscow  
Russia  
Tel: 7 095 939 3673

### Global Change and Permafrost

#### Chair: Dr. Frederick E. Nelson

Department of Geography and Planning  
State University of New York at Albany  
Albany, New York 12222  
USA  
Tel: 1 518 442 4469, 4770  
Fax: 1 518 442 4867  
E-mail: fnelson@cnsvox.albany.edu

#### Secretary: Mr. Alan E. Taylor

Terrain Sciences Division  
Geological Survey of Canada  
601 Booth St.  
Ottawa, Ontario K1A 0E8  
Canada  
Tel: 1 613 996 9324  
Fax: 1 613 992 2468  
E-mail: ataylor@gsc.emr.ca

### Mountain Permafrost

#### Chair: Dr. Wilfried Haeblerli

VAW/Glaciology  
Gloriastrasse 37/39  
ETH Zentrum  
CH 8092 Zurich  
Switzerland  
Tel: 41 1 632 4093  
Fax: 41 1 632 1192  
E-mail: haeblerli@vaw.ethz.ch

**Secretary:** Dr. Francesco Dramis  
Dipartimento di Scienze della Terra  
Università di Camerino  
Via Betti 1/A  
62032 Camerino  
Italy  
Tel: 39 737 40827  
Fax: 39 737 40839

### Periglacial Processes and Environments

#### Chair: Dr. Antoni G. Lewkowicz

Department of Geography  
University of Ottawa  
P.O. Box 450 Stn A  
Ottawa, Ontario K1N 6N5  
Canada  
Tel: 1 613 564 2244  
Fax: 1 613 564 3304  
E-mail: alewkowi@acadvm1.uottawa.ca

#### Secretary: Dr. Charles Harris

Department of Geology  
University of Wales  
P.O. Box 914  
Cardiff CF1 3YE  
United Kingdom  
Fax: 44 222 874326  
E-mail: sgich@cardiff.ac.uk

### Cryosols

#### Chair: Dr. David A. Gilichinsky

Institute of Soil Science and Photosynthesis  
Russian Academy of Sciences  
1242292 Pushchino  
Moscow Region  
Russia  
Tel: 7 095 923 3558 (Moscow)  
Tel: 7 095 923 1887 (Pushchino)  
E-mail:  
gilichin@issp.serpukhov.su(sotnikov)

#### Secretary: Dr. Chien Lu Ping

Palmer Research Center  
University of Alaska  
533 E Fireweed  
Palmer, Alaska 99645  
USA  
Tel: 1 907 746 9462  
Fax: 1 907 746 2677  
E-mail: pfclp@alaska.bitnet

### Foundations

#### Chair: Mr. James W. Rooney

R&M Consultants  
9101 Vanguard Drive  
Anchorage, Alaska 99507  
USA  
Tel: 1 907 522 1707  
Fax: 1 907 522 3403

#### Secretary: Dr. Kaare Flaate

Norwegian Directorate of Public Roads  
P.O. Box 8142 DEP  
N 0033 Oslo  
Norway  
Tel: 47 22 073 900  
Fax: 47 22073 444

### Seasonal Freezing and Thawing of Permafrost Areas

#### Chair: Dr. Arvind Phukan

School of Engineering  
University of Alaska Anchorage  
3211 Providence Drive  
Anchorage, Alaska 99508  
USA  
Tel: 1 907 786 1970  
Fax: 1 907 786 1079

#### Secretary: Dr. Branko Ladanyi

Dept de Genie Civil  
Ecole Polytechnique  
CP 6079 Succ A  
Montreal, P.Q. H3C 3A7  
Canada  
Tel: 1 514 340 4804  
Fax: 1 514 340 5841

## Individuals

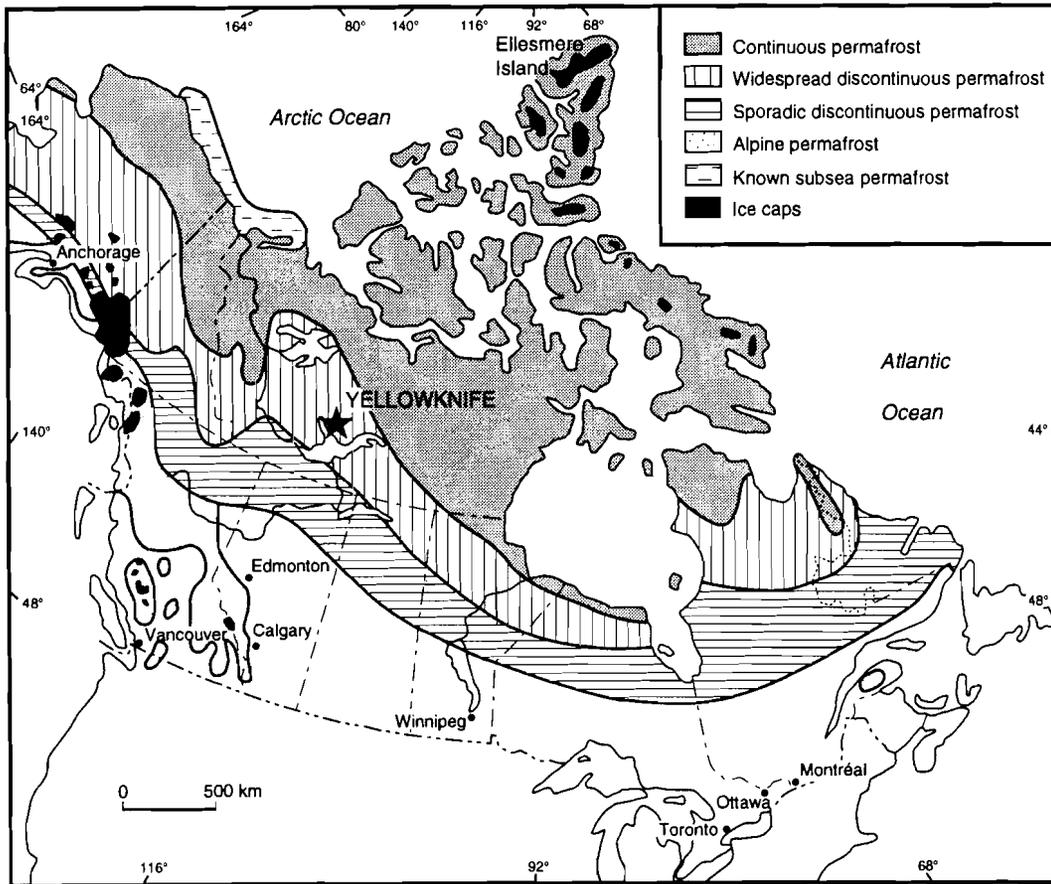
(from countries for which no adhering bodies exist)

Rein Vaikmäe, Institute of Geology, Estonian Academy of Sciences, 7 Estonia Ave., EE-0105, Tallinn, Estonia  
Fax: 7 0142 44 41 89; E-mail: vaikmae@isogeo.gi.ee

**VII International Conference on Permafrost**  
Yellowknife, Northwest Territories, Canada • 23–27 June 1998

Sponsors

IPA • National Research Council of Canada • Geological Survey of Canada  
Contact J.A. Heginbottom, Geological Survey of Canada, 601 Booth St., Ottawa, Ontario, Canada K1A 0E8  
Tel: 613 992 7813 • Fax: 613 992 2468 • E-mail: heginbottom@gsc.emr.ca



First Announcement

**High Arctic Field Meeting**  
**Ellesmere, Axel Heiberg, and Cornwallis Islands**

IPA Working Group on Periglacial Processes and Environments  
and  
IGU Commission on Frost Action Environments  
8–17 July 1996

Approximate cost: \$5000 Can.  
Contact Dr. Antoni G. Lewkowicz, Department of Geography,  
University of Ottawa, Ottawa, Ontario, Canada K1N 6N5  
Tel: 613 564 2244 • Fax: 613 564 3304 • E-mail: alewkowi@acadvm1.uottawa.ca

Second Announcement: May 1995  
Papers invited on theme: Climate Variability and Change in Geomorphic Processes