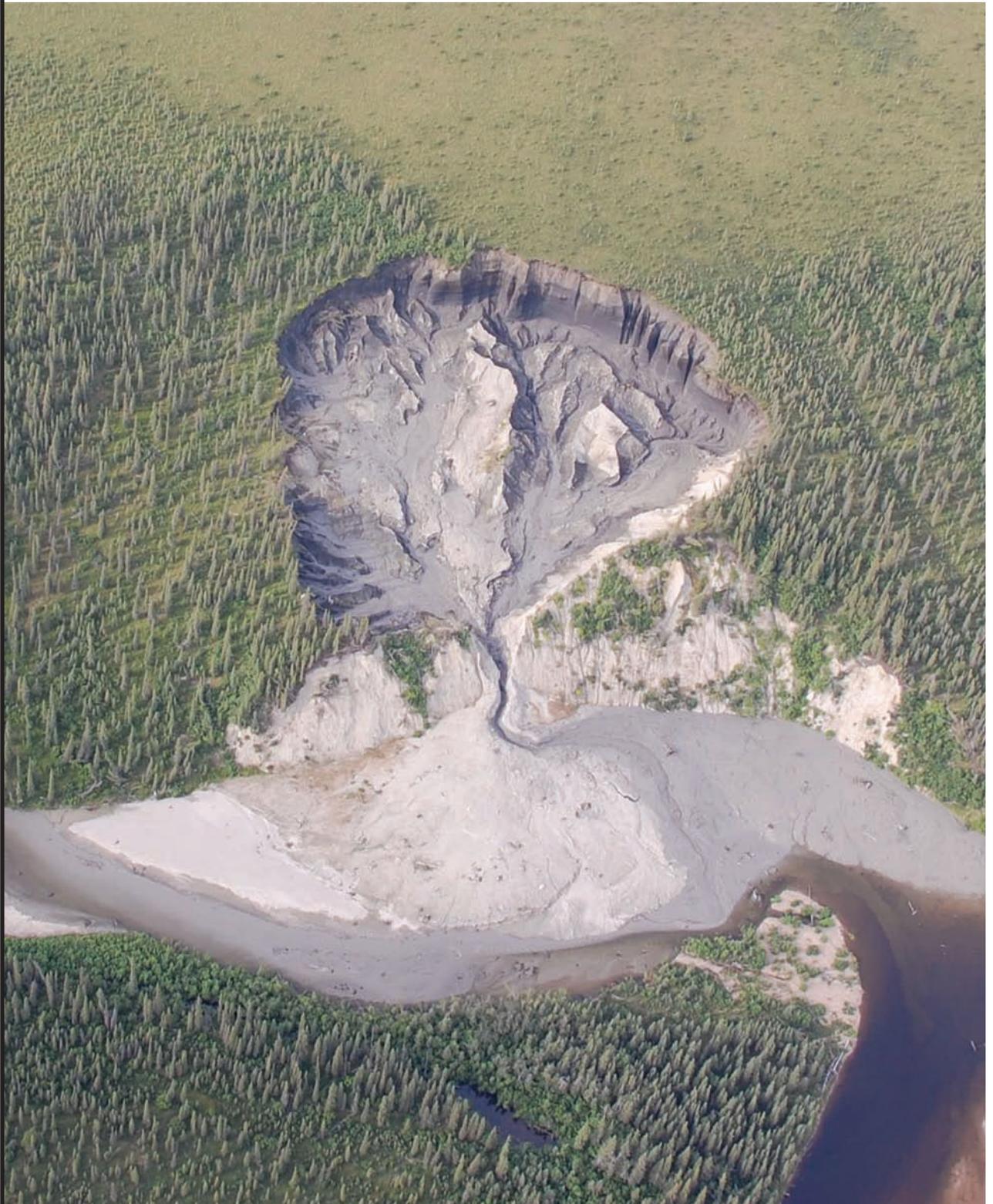


FROZEN GROUND



The News Bulletin of the International Permafrost Association

Number 31, December 2007



INTERNATIONAL PERMAFROST ASSOCIATION

The International Permafrost Association, founded in 1983, has as its objectives to foster the dissemination of knowledge concerning permafrost and to promote cooperation among persons and national or international organisations engaged in scientific investigation and engineering work on permafrost. Membership is through national Adhering Bodies and Associate Members. The IPA is governed by its officers and a Council consisting of representatives from 26 Adhering Bodies and Associates having interests in some aspect of theoretical, basic and applied frozen ground research, including permafrost, seasonal frost, artificial freezing and periglacial phenomena. Committees, Working Groups, and Task Forces organise and coordinate research activities and special projects.

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

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Academician Cheng Goudong, China (1993-1998)
Professor Hugh M. French, Canada (1998-2003)

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Isotopes and Geochemistry of Permafrost
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*Cover: Large retrogressive thaw slump, northwest Alaska (66°29'51"N, 157°36'27"W). This 2004 slump was triggered by lateral erosion of the Selawik River into buried glacier ice at a depth of 30 m. During summer 2007, an estimated 25,000 to 60,000 tons of sediments were removed from the slump, causing downstream impacts on local subsidence, commercial and sports fishing (inconnu or coney, *Stenodus leucichthys*). The slump discharged about 250g/l of suspended sediments at a rate of 100 l/sec from thawing permafrost during the summer season. Since 2004, sediments deposited in the spawning area (40 km from the slump) is estimated at 36,000 tons with the riverbed completely covered by sediments. Impacts to Selawik River inconnu may not be known until this aged cohort reaches maturity in about 7 to 12 years. Photograph and information provided by Kenji Yoshikawa, University of Alaska Fairbanks.*

FROZEN GROUND

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INTERNATIONAL PERMAFROST ASSOCIATION
NUMBER 31 • DECEMBER 2007

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The IPA is a non-governmental association of national organisations and associates representing 26 countries. The success of the bulletin depends upon the willingness of IPA participants to supply information for publication. News items from any IPA participant or others are very welcome, as are interesting photographs. To submit news items or photos please contact:

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All issues of *Frozen Ground* are also available as PDF files on the IPA web site (www.ipa-permafrost.org). This issue of *Frozen Ground* was compiled and edited by Herman Farbrot, Jerry Brown and Hanne H. Christiansen.
The IPA Secretariat is supported by The Research Council of Norway and The University Centre in Svalbard, UNIS.

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EXECUTIVE COMMITTEE REPORT

This year was highlighted by the formal beginning of the International Polar Year and the IPA participation. IPA was officially represented at the IPY opening in Paris on March 1 by the Permafrost Young Researchers Network (PYRN). Norway celebrated its opening in Oslo and on Svalbard. Several IPA participants joined the Arctic Science Summit Week in Hanover, New Hampshire, in March. The annual Russian permafrost conference in Salekhard was an IPY event as were the Iberian conference in Guarda, Spain, and the Polish meeting in Svalbard. The four IPA coordinated IPY permafrost projects are underway. The PYRN has over 400 members in 35 countries, two field courses were held in Siberia this summer, the PYRN-TSP was launched, and a permafrost methods workshop was held for young researchers in St. Petersburg, Russia, in early December (see PYRN report for details).

A workshop on Antarctic permafrost, data and mapping was convened as part of the International Symposium on Antarctic Earth Sciences in August. Members of the cold regions engineering community attended the ISCORD conference in Tampere, Finland, in September. In October, IPA participated in the Second CLiC Asian Cryosphere Conference in Lanzhou, China. In November, IPA was represented at the Stockholm workshop on Sustaining Arctic Observing Networks (SAON). Numerous other national and regional meetings included IPY permafrost sessions (AGU, EGU).

This issue of *Frozen Ground* does not include the annual reports from Committees and Working Groups (WG). An editorial on the importance of the IPY-IPA data legacy is presented herein. The WG will prepare five-year reports for the June 2008 Council review and their publication in the Ninth International Conference on Permafrost (NICOP) documents. During this past year, an evaluation of WG activities was conducted by a three person, ad hoc review group consisting of Roger Barry (chair), Eduard Koster and Kaare Flaate. The evaluation indicates most WG are active and productive. There was a consensus that most goals and objectives were too broad and that future activities should be more focused. Also recommended was the need to re-establish an oversight process to insure progress and coordination. Liaison with other international organizations was well recognized and encouraged.

New initiatives this year were undertaken with the International Association for Engineering Geology and the Environment (IAEG) and the International Union for Quaternary Research (INQUA). These on-going and future activities will be reviewed at the Council

meetings during NICOP. New working group activities for 2008-2012 are welcome.

Members of the Executive Committee met in Salekhard in June and San Francisco in December. At the latter meeting we reviewed plans for NICOP with the U. S. organizers, discussed actions for the Council meetings in Fairbanks, and reviewed and prepared the slate of nominees for the election of a new Executive Committee. The Council will meet on June 28, 2008, in open session. Working Party co-chairs and members and representatives of international organizations are invited to join the Council meeting; the agenda will be posted on the IPA and NICOP webs. We note the departure of Dr. Angélique Prick from the IPA Secretariat where she performed in an outstanding manner since 2005; her presence will be greatly missed. Angélique's replacement is Dr. Herman Farbot.

Planning for the NICOP is well advanced. Based on the approximate 600 abstracts that were submitted from 30 countries, over 400 papers are in final review for publication in the printed Proceedings. Additional extended abstracts will be published in NICOP documents. Daily plenary sessions will highlight recent advances in permafrost science and engineering. Planning for pre- and post-conference field trips is nearing completion (see the NICOP web for pre-conference registration). Several special events recognizing the 25th anniversary of IPA are planned. The June IPY international science day events will take place during the NICOP period under the theme 'Land and Life'. Permafrost will be well-represented by many NICOP and PYRN activities. Other events include an IPY Forum and several PYRN social and technical activities. We look forward to seeing many readers of *Frozen Ground* in Fairbanks.

In addition to NICOP, summer 2008 will be an extremely busy period for other conferences and field courses and research. The annual Russian geocryology conference in Pushchino in April and the Forum for Young Scientists in Yakutsk in August will honour the 100th anniversary of Academician P.I. Melnikov. The SCAR-IASC conference is in early July in St. Petersburg, Russia. In August, IPA representatives will participate in the International Geological Congress in Oslo and the International Geographical Congress in Tunis.

Finally, the Executive Committee notes with great sadness the passing of A.L. Washburn, a close colleague and world authority on geocryology, and Rositlov Kamensky, former director of the Permafrost Institute, Yakutsk.

MEMORIAM: ALBERT LINCOLN WASHBURN AND TAHOE WASHBURN, 1911-2007

Bernard Hallet, Quaternary Research Center,
University of Washington, Seattle, Washington



The frozen ground community lost two of its foremost members in 2007. Very sadly Lincoln Washburn and his wife Tahoe passed away in Seattle. Link, as his many friends knew him, died on January 30; he was 95. Tahoe died on September 3, at age 96. For 71 years they formed a strong, loving team that contributed immensely to the frozen ground community through their visible devotion to Arctic lands and to polar researchers, and their exceptional ability to touch deeply the lives and careers of many of its members. These personal contributions complement Link's numerous scientific achievements and considerable accomplishments as an academic leader.

Link's pioneering discoveries about processes shaping Arctic landscapes are presented in carefully crafted articles, monographs, and authoritative books that are recognized worldwide. Reflecting on his research, Link said in one of his rare speeches in 1988: "To test the forefront of knowledge for even a brief period, particularly when the subject matter concerned the intimate workings of nature, provided both a motivation and challenge that are deep and real for me...". This was evident in his own meticulous and exhaustive field and laboratory studies of diverse types of processes that shape Arctic lands. His deep interest in patterned ground formation, slope movement, and ice growth in soils and his untiring, generous effort to properly present the work and ideas of researchers worldwide are clearly visible in his monographs and renowned books that remain the standard references in the field (*Periglacial Processes and Environments*, 1973; *Geocryology—A Survey of Periglacial Processes and Environments*, 1979). His last major publication, which examines in detail the genesis and properties of patterned

ground on Cornwallis Island in Arctic Canada, appeared in 1997 as he reached the age of 85.

On a more personal side, Link inspired, stimulated, and encouraged researchers worldwide. Together with Tahoe, Link aided and guided numerous young researchers. They accomplished this through their exceptionally warm and encouraging personalities, their generosity, as well as their passion for, and deep commitment to Arctic science, landscapes and people. Their exceptional hospitality was renowned worldwide. Wherever they lived, from Montreal to Seattle, the Washburn home "came to be a natural Mecca for arctic people going through the city; a sort of unofficial hostelry of infinite hospitality" (Dunbar, 1952). Their love of the far north was also clear from their calendar, which revolved around a northward migration each summer to carry out field research; these sojourns to the Arctic continued well into their eighties. This love pervades Tahoe's own insightful account, *Under Polaris: An Arctic Quest*, of their life among the Inuit based on her journals written during their fieldwork on Victoria Island from 1938 to 1941.

Link was also a visionary. Decades before the emergence of "earth system science" and the widespread concern about global warming, Link conceived of, and launched, the Quaternary Research Center at the University of Washington to promote interdisciplinary research about the global environment during the Quaternary. Sensing the need for a scientific journal devoted to this important period that features the evolution of humans and the advent of civilization as well as massive, abrupt changes in climate, sea level, global biota, and ice extent, Link launched *Quaternary Research*, which appeared in 1970. "He shepherded the journal through its first 5 years, establishing for it a reputation for breadth and excellence, and making it one of the most widely cited earth science publications" (Porter, 2007).

Paraphrasing Porter (2007), Link's passion for snow, ice, and the Arctic can be traced to his student days at Dartmouth College, where he was an ardent member of the downhill ski team, and was invited to participate in the 1936 Winter Olympic Games. He participated in several demanding excursions that exposed him to high-latitude glacial and periglacial environments. After serving as Richard Foster Flint's field assistant on Louise Boyd's 1937 American Geographical Society expedition to Greenland, he enrolled as Flint's graduate student at Yale University. He completed his Ph.D. dissertation in 1942, based on extensive field studies in Arctic Canada. Nelson (2007) reported that both Flint and Washburn

served as officers in the U.S. Army Air Forces' Arctic, Desert, and Tropic Information Center (ADTIC) under the command of Colonel W.S. Carlson, another Arctic specialist. Soon thereafter, Link became the first executive director of the Arctic Institute of North America (AINA), an organization formed through the collaborative efforts of ADTIC personnel and U.S. and Canadian organizations. Link subsequently relinquished his post at AINA to head SIPRE, the U.S. Army's Snow, Ice, and Permafrost Research Establishment, which became the Cold Regions Research and Engineering Laboratory (CRREL) in 1961. He moved from SIPRE to join the faculty of Dartmouth College in 1953; he then joined the geology faculty at Yale University in 1960, and at the University of Washington in 1967.

Link was recognized and honored nationally and internationally. He was an honorary member of AINA, the International Glaciological Society, and the International Union for Quaternary Research. He received the Kirk Bryan Award of the Geological Society of America (1971), and the Andre H. Dumont Medal of the Geological Society of Belgium (1975). He received an Honorary Doctorate from the University of Alaska (1981) and the Vega Medal of the Swedish Academy for Anthropology and Geography (1997). He was elected an associate member of the Royal Academy of Belgium (2000). Steve Porter (2007) provides a listing of the many national and international committees and organizations for which Link served as a directing officer, as well as a selected bibliography.

Highlights of Link's career include unfailing scholarship, research, and administration. These were widely recognized well beyond national boundaries as was aptly expressed by Albert Pissart (personal communication

from Liege, Belgium, 2007) while reflecting on his deceased friend; having not seen him for a few years he wrote: "j'avais conservé un culte pour ses travaux, son honnêteté scientifique, sa modestie et son extrême amabilité". Loosely translated, Albert worshipped Link's work, his scientific honesty, his modesty, and his extreme kindness. In addition to his renowned articles and textbooks, the research centers he directed, and the scientific journals he launched, his rich scientific legacy includes the unusually cohesive and amiable permafrost and periglacial community, the emergence of which was fostered in part by Link and Tahoe's warmth, generosity, and friendship that reached many members of this worldwide community.

Acknowledgements: I am thankful to Steve Porter and Carl Benson for their thoughtful obituaries. I have borrowed material from these obituaries liberally, as well as from my own report in *ICE Number 163, 16:7 (2007)*. It is my pleasure to thank Link's son, Land Washburn, for providing the picture from a collection of Resolute photographs, Jerry Brown and Frederick Nelson for their contributions to this report, and Albert Pissart for capturing the essence of Link's exceptional qualities and informing me that Link had received the highest scientific recognition possible in Belgium as an elected associate member of the Royal Academy.

Benson, Carl S. 2007. Albert Lincoln Washburn(1911-2007). *Arctic*, 60(2): 212-214.

Dunbar, M.J. 1952. A.L. Washburn. *Arctic* 5(1):3.

Nelson, F.E. 2007. In Memoriam: Albert Lincoln Washburn (1911-2007). *Ubique: Notes from the American Geographical Society* 28(2): 12.

Porter, S.C. 2007. In Memoriam: A. Lincoln Washburn (1911-2007). *Quaternary Research* 67: 311-312.

BUILDING THE IPA-IPY DATA LEGACY: AN EDITORIAL

The large amount of permafrost-related information (including data, models, references, and syntheses) to be generated during the International Polar Year (IPY) presents a great opportunity and grand challenge for the IPA. IPA's coordination and leadership of several important IPY projects can take advantage of this opportunity. The challenge is to ensure that both the IPY "data snapshot" and continuing observations are compiled, maintained, and available for the present and in the future. The Standing Committee on Data, Information, and Communication (SCDIC), as a permanent element of the IPA, seeks to meet that challenge, but we need the help of the entire permafrost community.

IPA has a rich heritage and commitment to share, compile, and archive data. At the last two International Conferences on Permafrost (Yellowknife and Zurich), the SCDIC released CD compilations of permafrost-related data and metadata called the Circumpolar Active-layer Permafrost System (CAPS1 and 2). These were major milestones for the IPA, but the process has not been sustainable. We do not plan to issue a CAPS version 3 at the Ninth International Conference on Permafrost in Fairbanks (NICOP). Instead, we focus immediate efforts on timely release and preservation of the data and information generated through IPY projects.

All IPA-IPY projects are expected to provide their data within national programs. The IPA must then update its data strategy to ensure that these results survive and can be readily usable in conjunction with other data, modeling, and synthesis activities. To achieve the IPY goals of greater international collaboration and interdisciplinary research, it is insufficient to simply share basic metadata. Data must be provided in more consistent formats through more interoperable data exchange protocols (e.g. OGC).

The major short-term goal of SCDIC is to create an initial compilation of permafrost data collected during IPY—an IPY snapshot that will provide information on the status of permafrost during a defined period. This snapshot would be made available at the end of IPY during the Early Science Conference in Oslo in 2010, and will be included on a future CAPS3. The table provides an overview of potential inventories and data sets for the snapshot. Upwards of 50 individual IPY projects are involved in these projects.

This IPA-IPY focused effort should then be continued and sustained to produce a more comprehensive data system building on previous and future data activities. The Tenth International Conference on Permafrost in 2012 provides a reasonable deadline for the creation of a comprehensive and sustained permafrost data system.

| Source | Description or Activity |
|---|---|
| GTN-P TSP (50) | Temperature data from hundreds of existing and new boreholes, periglacial process data, and permafrost landform ages. |
| GTN-P CALM (50) | Active layer data from more than 150 sites |
| ACD (90) | 1331 coastal segments described in a geodatabase, and related keysite data |
| ANTPAS (30) | Maps, thousands of soil profiles, and periglacial process data, including TSP data. |
| Carbon: CAPP (373) RASCHER (262) | Database of thousands of polygons with soil properties and carbon stocks |

Designing and producing a data snapshot and a lasting IPA data system will require the work of many individuals. We require a group of data champions from within each country who can organize the submission of data from their individual national IPY projects and other efforts. We call on the new generation of young researchers in the Permafrost Young Researchers Network (PYRN) to join in the process and find ways to share selective data prior to peer-reviewed publication. During NICOP, we will convene a meeting of these champions and other interested parties to develop the format and outline for the IPY snapshot product and also to develop the new and sustainable IPA data strategy. The legacy of IPY will be realized through the organization and sustainability of the data collected, the establishment of the network of long-term permafrost observatories, and the further development of the new generation to participate in the data management process.

Please contact one of us on behalf of the SCDIC to find out more and to assist in building that legacy. Also please consider presenting your IPY related data collection or observatories at NICOP, e.g. as an extended abstract.

Mark A. Parsons (parsonsm@nsidc.org),
Sharon Smith (ssmith@nrcan.gc.ca), and
Hanne Christiansen (Hanne.Christiansen@unis.no).
IPA Standing Committee on Data,
Information and Communication.

NEWS FROM MEMBERS

ARGENTINA (AND SOUTH AMERICAN PARTNERS)

D. Trombotto was invited to Mexico City to attend the regional Latin American meeting 'GEO sobre hielos y nieves' and to report on the framework of the United Nations Environmental Program (UNEP). The meeting was held for the presentation of the book *Global Outlook for Ice and Snow*. D. Trombotto contributed to this publication with the chapter on *Frozen Ground* organized and supervised by Vladimir Romanovsky.

D. Trombotto is participating in two projects of the International Polar Year, IPY; *Antarctic and sub-Antarctic Permafrost, Periglacial and Soil Environments* (ANTPAS-30) and *Land Impact on polar and sub-polar geosystems: extent, significance, perspectives* (LUPOG-282).

On occasion of the IPY the University of Comahue, Neuquén Province, Argentina, held a Symposium on Global Warming in the framework of the IPY (November) organized by the meteorologist M. Cogliati and the Canadian Center of Comahue (lead by M. Rosso). Active members of the South American Association of Permafrost presented reports on Andean geocryology (A.-L. Ahumada, D. Trombotto), on palaeopalynology, on the topic of fire records in Quaternary Patagonian stratigraphy (M. Bianchi), and on climatology from a natural and astronomical point of view associated with

global warming (R. Compagnucci). These contributions are published in the Boletín Geográfico Nr. 30 under the direction of G. de Jong from the Department of Geography, University of Comahue.

Thermal variations observed in the active layer of the Andean monitoring areas of the province of Mendoza, Argentina, was presented by D. Trombotto at the International Symposium on Antarctic and Earth Sciences at Santa Barbara, California, and at the Symposium on Research in the Field of Hydrological Resources held at the Universidad de Cuyo in Mendoza (September), as well as at regional conferences. In November monitoring results from the Mendoza province, was presented during the Third International ICES E-ICES meeting in Malargüe (November), at the Centre of Geosciences, Argentina. This centre is about to be opened with the help of the National Commission of Nuclear Energy (J. Ruzzante), Buenos Aires and the "Istituto di Acustica", Rome, Italy.

Data on thermal changes in the active layer and in suprapermafrost are still scarce and not well presented in the Andean Cordillera of Bolivia, Perú and Ecuador where B. Francou works. Publication in Spanish is urgently needed, since there is no scientific journal on geocryology, where scientific contributions and recent data can be published in Spanish. This situation places our researchers at disadvantage in the evaluation and distribution of information in prestigious and indexed journals.

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



New monitoring site at the active Peteroa Volcano (3400 m asl), Mendoza, Argentina. Photograph by D. Trombotto.

AUSTRIA

Current permafrost related research activities in Austria are carried out by an increasing number of institutions; University of Innsbruck, Vienna University of Technology, two universities in Graz (University of Graz and Graz University of Technology), University of Salzburg, Joanneum Research (Graz), Geological Survey of Austria (GBA, Vienna) and Central Institute for Meteorology and Geodynamics (ZAMG, Vienna and Salzburg).

The Innsbruck group (K. Krainer) started in summer 2007 a four-year project entitled *Permafrost in Austria*, funded by the Austrian Academy of Science. The project is divided into two parts including cooperation with the University of Vienna (E. Brückl, H. Hausmann and G. Blöschl), with the Central Institute for Meteorology and Geodynamics, Salzburg (M. Staudinger) and with the Geological Survey of Austria (A. Römer). The main objective of Part I, study area Weißsee peak, Kaunertal, Ötztal Alps, is to provide data on the present distribution

of alpine permafrost in unconsolidated sediments and to understand its influence on the hydrological regime under the aspect of climate change by applying various geophysical methods, by the development of numerical runoff models, and by integrating cross-disciplinary information from geology and hydrology, geophysics, and meteorology. Part II deals with degrading permafrost in rock mass at the Sonnblick observatory (3106 m asl), Goldberg Mountains. As reported in the previous issue of *Frozen Ground*, three 20 m and one 10 m boreholes were drilled in September 2005 along a sloping north-south profile. Continuous monitoring of temperature data at the 20 m boreholes (25 temperature sensors at each borehole; no published data yet) is carried out since August 2006. At these three boreholes seismic tomography will be applied. In addition, GPR, equipped with transmitters of various frequencies (20-500 MHz), will be tested. In combination with seismic tomography, as well as DC-resistivity, the data might yield information on fissures of the rock mass and their changing fill with ice, water or air.

The University of Graz (G.K. Lieb and A. Kellerer-Pirklbauer); Graz University of Technology (M. Avian and V. Kaufmann); Joanneum Research (A. Bauer and H. Proske) are primarily working on objectives defined within the project ALPCHANGE, which started in June 2006, and is supported by the Austrian Science Fund. During the first project year, equipment (e.g. temperature data loggers, remote digital cameras, meteorological stations) was installed at six high-altitude study locations in the Hohe Tauern and Niedere Tauern Ranges in central Austria, providing continuous logging of meteorological data as well as climate-change influenced processes (e.g. snow cover and slope stability monitoring by remote digital cameras). Additional ALPCHANGE-related research is: continuation of the annual geodetic

measurements on the Doesen, Hinteres Langtalkar and Weissenkar rock glaciers; resurveying of the front of the highly active Hinteres Langtalkar rock glacier by terrestrial laser scanning; geomorphic field mapping, sampling and BTS measurements at various study locations in the Hohe Tauern and Niedere Tauern Ranges. Some results of this ongoing project can be accessed at (www.alpchange.at).

Permafrost related observations (e.g. rock glacier mapping) were carried out within the framework of the project *A tale of two valleys* (<www.zamg.ac.at/a-tale-of-two-valleys>) by Joanneum Research (H. Proske), thereby focusing on the mountain areas north and south of the previously mentioned Sonnblick observatory.

The Central Institute of Meteorology and Geodynamics started a permafrost monitoring programme in Sonnblick region entitled PERSON (Permafrost monitoring Sonnblick) with two test fields (one with southern and one with northern aspect) of ground surface temperature measurements using temperature loggers and additional BTS measurements in March and April each year. This monitoring will be improved by a digital snow cover and snow depletion mapping, which are planned to start in winter 2007/08. Additionally, a detailed permafrost-modelling based on the PERMAKART and PERMAMAP approaches was performed for the Sonnblick region within the framework of a diploma thesis. An extension of the ground surface temperature network is planned for 2008.

The Salzburg group (L. Schrott) is currently initiating permafrost-related research projects in the European Alps and the Argentinean Andes. These activities are carried out within the newly established Research Group on Geomorphology and Environmental Systems (www.geomorphology.at). A MSc thesis on mountain permafrost modelling in the Austrian Alps was carried out by



Participants of the International Conference 'Geomorphology for the Future'. Photograph by M. Keiler.

B. Ebohon using previously published and compiled data and the programmes PERMAKART (for steep slopes) and PERM (for footslope-positions). The results show that the simulated map still needs some improvement on a larger scale, but it can provide a good general overview of the possible and probable permafrost distribution of the Austrian Alps.

During the General Assembly of the European Geosciences Union (EGU) in Vienna, in April 2007, a number of the above mentioned researchers participated in an informal meeting led by A. Kellerer-Pirklbauer (University of Graz). The main outcome of this meeting was the strong intention of joining forces to coordinate permafrost research in Austria. The project initiated by K. Krainer (*Permafrost in Austria*) can be regarded as a first achievement in this direction.

The Austrian Commission on Geomorphology changed its name to the Austrian Research Association on Geomorphology and Environmental Change (<www.geomorph.at>). This association, which is part of the Austrian Geographical Society and the International Association of Geomorphologists (IAG) Working Group on Geomorphology and Global Environmental Change, organised a conference focussing on the topic *Geomorphology for the Future* at the University Centre of Obergurgl in September 2007. The conference was organised by M. Keiler (University of Vienna), A. Kellerer-Pirklbauer (University of Graz), C. Embleton-Hamann (University of Vienna) and J. Stötter (University of Innsbruck). 40 scientists from 11 countries participated with oral and poster presentations, and two field excursions were held. Key topics addressed during the poster and oral presentations were permafrost and its spatial distribution, rock glacier creep, permafrost degradation and its influence on debris flow activity.

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

BELGIUM

In summer 2007, a team from Ghent University (Department of Geography, R. Goossens and A.D. Wulf and Department of Archaeology, J. Bourgeois and W. Gheyle), in collaboration with the Gorno-Altai State University and S. Marchenko (University of Alaska Fairbanks), conducted research from July 12 to August 12 in the valley of the Karakol River (Ongudai region, Altai Republic, Russian Federation). In 1950, archaeologist S.I. Rudenko excavated two enormous Scythian *kurgans* (burial mounds) in the valley of Karakol, on the site of Bashadar. Although the site is located not higher than 1097 m asl, the tombs

appeared to be frozen. The perfectly preserved grave goods and sarcophagus are still to be seen in the Hermitage Museum in St. Petersburg. But the Bashadar site is not the only place where kurgans are found in Karakol; hundreds of burial sites and ritual monuments are located in the valley, forming a rich archaeological landscape. The team of five archaeologists and two geographers first measured ground control points with a CNAV GPS-receiver, to process VHR historic CORONA satellite images and make a topographical map of the area. Then 1250 archaeological monuments were recorded, and localised with GPS. During the four weeks of fieldwork, only about half of the valley was surveyed due to the huge amount of monuments present. The team is planning to complete the work in the summer of 2008. S. Marchenko successfully downloaded all the temperature data loggers installed last year in the valley of Ulandryk (Kosh-Agatch region, Altai Republic). He installed data loggers in the Karakol Valley at the location of the Bashadar burial sites. These loggers will provide data for the annual temperature evolution in and around the huge kurgans of Bashadar (ca. 40 m diameter), that were at one time frozen.

Wouter Gheyle, Jean Bourgeois,
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CANADA

A collaborative project led by S. Smith (Geological Survey of Canada, GSC), A. Lewkowicz (University of Ottawa) and C. Burn (Carleton University) was one of 44 science and research projects announced in March 2007 that were selected for funding under the Canadian Government's IPY program. This project represents the main Canadian contribution to the International IPY project led by the IPA, Thermal State of Permafrost (TSP). TSP-Canada is examining the ongoing impacts of climate change on permafrost conditions. A primary objective will be the measurement of permafrost temperatures in new and existing boreholes in Canada over a fixed time period to provide a 'snapshot' of ground thermal conditions in both time and space, thus providing a baseline against which to measure change. The new IPY funding is facilitating the establishment of new boreholes to fill key gaps in the existing network. New boreholes have recently been established in the western Arctic including ones in the Yukon in collaboration with mining exploration companies. Collaboration with Parks Canada has facilitated the establishment of new boreholes in northern Manitoba. Discussions are currently under way with communities in Nunavut to collaboratively establish boreholes next year to fill key gaps in the central

and eastern Arctic. Data collected from existing boreholes during the first IPY year are currently being compiled and analysed, and preliminary results will be presented in a poster at NICOP and in outreach products for northerners.

At the University of Ottawa, A. Lewkowicz and his graduate students are continuing their research on permafrost distribution and characteristics in the Yukon. One of their contributions to the TSP IPY project was to repeat a survey of permafrost conditions along the Alaska Highway undertaken by the late Roger Brown in 1964. The results show that significant loss of permafrost has occurred over the past 43 years. In addition, they undertook Basal Temperature of Snow (BTS) measurements in five study areas spread across the southern Yukon in March 2007 and followed up these with ground-truthing at the same sites in August. They now have a network of more than 80 air and ground temperature monitoring stations in six clusters spread throughout the climatological regions of the southern half of the Yukon Territory. The goal of this project, which is primarily financed by the Canadian Foundation for Climate and Atmospheric Sciences, is a detailed permafrost probability map for this area of 250,000 km². Further BTS and ground-truthing measurements are planned for 2008, as well as investigations of vegetation type and rock glaciers as permafrost indicators.

Lead by W. Pollard the permafrost activities at McGill University (contact: W. Pollard, Department of Geography) were divided into three themes. *Landscape dynamics associated with massive ground ice and the vulnerability of ice-cored environments to climate change* (VICE) was submitted as a separate project to the IPY Program (Project 376) and was subsequently linked to IPY Project 50 TSP. This theme includes ongoing monitoring of retrogressive thaw slumps and ground ice mapping on Ellesmere Island in the high Arctic and Herschel Island in the southern Beaufort Sea by Pollard. It also includes research linked to three graduate student projects. N. Couture is doing PhD research concerned with the analysis of coastal erosion process and the calculation of soil organic carbon fluxes into the Beaufort Sea. Couture has been analysing changes in the position of coast and computing the volume fraction of sediment, ice and carbon for different terrain systems. This research also involves modelled predictions of erosion patterns using wave-simulated climate forecasts based on GCM outputs and a thermo-mechanical model for wave-induced erosion. This project is also linked to the IPY Project 90: *Arctic Circumpolar Coastal Observatory Network* (ACCO-Net). A. Hoque was also part of this project.

T. Haltigin (McGill) is doing PhD research concerned with high Arctic ice-wedge dynamics, and the analysis of

relationships between the geometric patterns of ice-wedge polygons with surfaces of different age but common climate and geology. This research involves the collection and analysis of georeferenced aerial photograph mosaics, analysis of surficial geology and ground ice conditions based on GPR and resistivity surveys, and the development of a point pattern statistical technique that reveals degrees of similarity of polygon geometry between different sites. This research fits into the Canadian Space Agencies analogue research program.

J. Grom (McGill) is doing MSc research studying the microclimatic feedbacks within retrogressive thaw slumps in high Arctic polar deserts. In this study automatic weather stations were placed inside and outside a retrogressive thaw slump, and instrumentation was positioned at the retreating ice face. Preliminary data suggest that under certain climate conditions there is an amplification of thaw processes linked to slump morphology.

In 2007 a new spring system was located bringing the total of spring systems mapped to eight. Each system is characterized by very different geologic, hydrologic, thermal and hydrochemical characteristics raising questions about groundwater source, age, flow paths and biophysical properties. In 2007 new data on spring hydrogeology, geomorphology and microbial ecology were collected. This research is being undertaken in collaboration with D. Andersen (SETI) and L. Whyte (McGill). These systems provide insights into the cold temperature biophysical limits of water on Earth and provide a valuable analogue for past and even present groundwater systems on Mars.

In collaboration with R. Gowan (Federal Department of Indian and Northern Affairs) and funded by the Federal Panel on Energy Research and Development, research continued on ground ice occurrence in coarse-grained sediments. The occurrence of ground ice in sand and gravel deposits has significant implications for both granular resource estimates as well as resource extraction. In 2007 late winter fieldwork focused on geophysical mapping of ground ice in glacial deposits on Richards Island in the Mackenzie Delta. Also the data for the last four years were collated into a summary report in preparation for the next phase of massive ice mapping. Researchers involved in this research included G. De Pascale, T. Haltigin and N. Couture. Although not linked with the VICE project, the data collected in this study will be incorporated into the final analysis of landscape vulnerability.

The coastal and nearshore borehole program of the Geological Survey of Canada (GSC Atlantic Division, contact: S. Solomon) drilled six boreholes 10 m deep across a shoal containing near surface permafrost. Ice thickness above the seabed ranged from a few cm to 1.2

m. University of Calgary undertook ground penetrating radar surveys across the surface of the shoal and conducted downhole radar at each borehole. Ground temperature data from thermistor cables deployed in March 2005 in boreholes at four of the core locations were successfully recovered for the second consecutive years, providing two complete years of temperature data from beneath bottomfast sea ice. Permafrost thicknesses along the transect exceed 20 m. Further collaborative work with B. Moorman and C. Stevens, University of Calgary, aims to define the controls on permafrost within shallow water environments and develop geophysical applications, which can provide useful spatial information on the thermal/physical conditions within the coastal zone. This research also includes quantification of heat flow in the ground throughout periods of open water and ice cover. Laboratory freeze-thaw experiments will be conducted with cores obtained from the delta site.

Bottomfast ice (BFI) controls the distribution of nearshore permafrost. Its distribution in the Mackenzie Delta region can be mapped with synthetic aperture radar. The GSC-Atlantic Division has been using this technique to monitor changes in BFI extent for the past four years. Ground penetrating radar and drill verification have been conducted each year to confirm the delineation of bottom-fast ice. Interannual variability depends primarily on ice thickness, but is also dependent on water levels at the time of freeze-up. The effect of variations in ice conditions on near-surface thermal conditions is currently being investigated by the University of Calgary.

Global positioning system (GPS) measurements are being undertaken at a network of recently installed benchmarks to monitor natural subsidence over the Mackenzie Delta surface (GSC Atlantic Division). The information will be used to help understand impacts of subsidence induced by human activities (i.e. hydrocarbon extraction) in the region.

Studies in coastal communities in Nunavut are underway to determine potential impacts of climate change and to help develop adaptation strategies (GSC Atlantic Division). Coastal permafrost and associated erosion processes are important factors for quantification of impacts.

A recent fire on Ibyuk Pingo in the Pingo Canada landmark caused wide spread destruction of surface vegetation and organic layers. GSC-Atlantic Division personnel undertook surveys in the region in order to monitor surface elevation changes that may result from the fire.

In the last three years, the Geological Survey of Canada-Northern Division (contact: R. Couture), through the Secure Canadian Energy Supply Program, has been contributing new geoscience information on

regional landslide hazards along a new proposed pipeline corridor in the Mackenzie Valley. This initiative aimed to i) provide baseline knowledge on the types, regional distribution, and control of landslides through a compilation of existing and new information; ii) monitor zones of potentially unstable slopes along the proposed gas pipeline route using remote sensing technologies; and iii) map susceptibility to landslides in a permafrost environment. Over 1800 landslides and other natural terrain hazard features (e.g. karstic sink holes, rock glacier) have been mapped along the proposed gas pipeline route, between Norman Wells and Inuvik, and integrated into a GIS spatial database. A preliminary landslide susceptibility map has been developed using a qualitative parametric method driven by expert judgment taking into account environmental parameters, such as geology, land cover, permafrost, and slope angle and aspect. Such a susceptibility map is useful for a better land and infrastructure planning. Finally, ten corner reflectors were deployed at various landslide sites with the objectives of monitoring active landslides and slopes through a remote sensing technique, InSAR (Interferometric Synthetic Aperture Radar) – the first ever such program in Canada. Such monitoring with InSAR will improve the understanding of slope movements in permafrost environments that are otherwise difficult to analyse with standard geotechnical tools.

GSC modellers at GSC- Northern Division (Contact: C. Duchesne; M. Ednie and F. Wright) have initiated a GIS-based geostatistical analysis of slope instability (slides, slumps) in the Mackenzie River valley, as part of a broader regional assessment of the geothermal and geomorphological responses of terrain to continued climate warming. The predictive component of the modelling will evaluate terrain instability potentials along existing and proposed pipeline corridors, and possible changes in these potentials over the next century. A Weights-of-Evidence-based analytical toolkit enables an integrated analysis of key physical and geothermal attributes of the permafrost landscape, such as geology, vegetation cover, topography, and surface hydrology, in the context of evolving permafrost conditions. The results of this work will be of interest to engineers, government agencies and community stakeholders concerned with the long-term viability of linear infrastructure in the north. The project is sponsored by the Program of Energy Research and Development and is scheduled for completion in March 2008.

R. van Everdingen, Senior Research Associate with the Arctic Institute of North America, University of Calgary, performed airphoto interpretation for the Mackenzie Gas Project to identify karst features in selected areas along the Mackenzie River.

The Canadian Geotechnical Society's Roger J.E. Brown award is given for an outstanding publication in the field of frozen soil research or engineering, or to honour an individual for his or her excellence in the field of permafrost. The worthy recipient of the 2007 Roger J.E. Brown Award was Dr. Chris Burn. Dr. Burn holds an NSERC Northern Research Chair, and is a Professor in the Department of Geography and Environmental Studies at Carleton University in Ottawa. He came to Canada in 1981 as a Commonwealth Scholar, and completed both the M.A. and PhD at Carleton, studying permafrost. He then moved to U.B.C. as a Killam Fellow. Chris has been studying frozen ground since 1982, and has a particular interest in the effects of climate change in the Canadian north. His research includes work at research stations in the Yukon and Mackenzie Delta as well as extensive investigations at the Illisarvik experimental drained lake site in the Mackenzie Delta, with world renowned Canadian permafrost pioneer, J. Ross Mackay. His work links the scientific study of permafrost with the practical needs of engineers working in the North, which is evermore critical to the successful and sustainable development of the North. This is especially important given the extensive northern mining and oil and gas developments ongoing and proposed for northern Canada.

In late November 2007, the Joint Review Panel (JRP) closed their environmental assessment review hearings on the proposed Mackenzie Gas Project (MGP). The MGP would involve the development of three onshore natural gas fields in the Mackenzie Delta, and the transport of natural gas and natural gas liquids via buried pipelines south through the continuous and discontinuous permafrost regions of the Mackenzie valley to northwestern Alberta. The applications and environmental impact studies for the proposed MGP were filed in October 2004, triggering the regulatory review process. The JRP comprehensive and extensive environmental assessment review hearings commenced in February 2006. The JRP held numerous topic specific (both bio-physical and socio-environmental) hearings as well as community hearings. The JRP's report is expected in spring 2008. Following the government's response the National Energy Board will then conclude their hearings (expected in late 2008) and render their decisions on the project. Many permafrost scientists and engineers, from government, universities and the private sector were actively involved over the last three years in the technical aspects of the project investigations and design, or its regulatory review. Further information on the MGP project and its review, and links to the JRP and NEB public registry; see the Government of Canada's Northern Gas Project Secretariat at: <www.ngps.nt.ca>.

K. Biggar and L. Arenson have recently joined BGC Engineering Inc. in their Edmonton and Vancouver offices, respectively. Biggar has 20 years experience in permafrost and frozen ground engineering, and 15 years in geo-environmental engineering including contaminated site assessment and remediation, mine waste management and horizontal directional drilling applications. Arenson has extensive research experience related to mountain permafrost, frost heave and modeling of convective heat transfers to industry.

The Canadian National Committee for the International Permafrost Association (CNC-IPA) would like to highlight and express the acknowledgement for the financial support provided by the Canadian Geotechnical Society's Cold Region Division to distribute *Frozen Ground* in Canada. We thank the outgoing chairman, Jim Cassie of BGC Engineering in Calgary, for instituting this support. We welcome E. Hoeve of EBA Engineering in Yellowknife as their new chairman effective in the New Year.

In closing, the CNC-IPA is pleased to announce that together with the Calgary Chapter of the Canadian Geotechnical Society (CGS), they will be co-hosting in Calgary, in September 2010, a joint Canadian National Permafrost Conference and annual Canadian Geotechnical Conference (CGC). A Canadian Permafrost Conference has been long overdue, the last having been held in Quebec in 1990. Fitting nicely between the international conferences now to be held every four years, the 2010 Conference will be an opportune time for the Canadian community to gather and to share the developments in the recently increasing process-based and climate change related scientific research and engineering activity in the Canadian north.

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CHINA

Major activities included the permafrost research for the China-Russia Oil Pipeline, continued research and monitoring on the operating Qinghai-Tibet Railway and Highway, the feasibility study on the Qinghai-Tibet Expressway, and the Sino-German expeditions to the Western Kunlun Mountains. Permafrost-related meetings include the Sino-German Symposium on the Qinghai-Tibet Plateau Research, the CliC conference and the Symposium on the Qinghai-Tibet Plateau.

China-Russia Pipeline Permafrost Research

The China-Russia Oil Pipeline is designed to transport unheated Siberian crude oil at about 600,000 bpd by

modified burial across 1,030 km of frozen ground. Construction is scheduled to be between November 2007 and July 2008. The design is significantly challenged by frost heave.

Detailed surveys of permafrost conditions along the pipeline route, and construction modes were conducted. Permafrost forecasts, thermal and strain/stress analyses, measures to mitigate frost hazards, and the system for long-term monitoring on pipe-soil interactions and early warning of developing frost hazards were conducted. About 500 boreholes were drilled and cored for analyses, and frozen ground conditions were evaluated and predicted. Engineering measures, such as excavation and back filling, insulation, and drainage control, were proposed and adopted for mitigating frost hazards for pipeline foundations. H. Jin and Y. Sheng from the State Key Laboratory of Frozen Soils Engineering (CAS-SKLFSE-CAREERI) are the lead scientists on the projects, and they plan to present papers at NICOP.

Permafrost investigation in the western part of Northeastern China

A team of eight scientists conducted field investigations on the distribution and relict periglacial phenomena in the western part of Northeastern China, i.e., from Mo'he to Gulian, Mangui on the western slopes of the Da Xing'anling Mountains, to Hailar and other regions on the Hulunber Plain, southwards to permafrost areas in the Arshan Mountains. Many involutions and soil/sand wedges were discovered and sampled for analyses. An inactive ice wedge group associated with polygonal morphology was excavated and sampled for detailed analyses.

Sino-German Joint Permafrost Research on Western Qinghai-Tibet Plateau

To further understand the degradation process of permafrost on the Qinghai-Tibet Plateau and its environmental impacts, a Sino-German joint team from the Institute of Environmental Physics, University of Heidelberg, Germany, and CAS-SKLFSE-CAREERI conducted comparative research on warm permafrost ($>-1^{\circ}\text{C}$) in the eastern part, and cold ($<-4^{\circ}\text{C}$) permafrost in the Tianshuihai Lake region in the western part. The ecological environments in the Tianshuihai region have changed greatly during the past 30 years; large areas of vegetation have degraded or disappeared, with considerable surface soil salinization. Small pingos, unsorted circles, sand wedges and polygons were identified.

In addition to the three stations established at Zuimatan, Qumahe and Chumaerhe in 2006, a fourth long-term monitoring station was established in the Tianshuihai Lake region in the Western Kunlun

Mountains in August-September 2007, with the purpose of comparative studies of regional differential response of permafrost to climate changes. Conventional exploratory methods such as hand-dug pits, water and soil sampling, in situ measurements of soil moistures and near-surface soil temperatures, and surface surveys were augmented with new geophysical investigation methods, including electrical resistivity tomography, new multi-channel ground penetrating radar, electromagnetic survey, and vertical electrical sounding for investigating the structures of the active layer, permafrost, cryogenic phenomena and vegetative differentiations, distribution of ground water tables and soil moisture, migration of salts, the physical properties of permafrost in the vicinity of the permafrost table, and the thickness of permafrost.

Other developing permafrost projects

A survey of permafrost conditions on the Qinghai-Tibet Plateau was initiated by the Ministry of National Land and Resources and organized by CAS-CAREERI. This project aims to understand the status of permafrost and its changes during the past 50 years through field expeditions and investigations, geophysical explorations, data collection, and modelling/mapping using the latest technologies. The project would be led by L. Zhao at the Golmud Permafrost Station, CAS-CAREERI.

M. Wei and Q. Wu at the SKLFSE obtained funding for projects on long-term monitoring and early warning system for developing hazards along the Qinghai-Tibet Railway and Highway. More than 100 cross-sectional profiles along the highway and railway were established to monitor permafrost-related problems or mitigative effects of engineering measures.

A CAS project was awarded to SKLFSE for the feasibility study of the Qinghai-Tibet Expressway from Golmud to Lhasa. This project would provide technical support for route selection, mitigative measures for frost hazards and design, construction of highway foundations and environmental management. Chief scientists are M. Wei and Q. Wu.

The Ministry of Science and Technology granted a National 973 Project for studying cryospheric changes in China to CAREERI. Permafrost and changes of cold regions environments, and their adaptation are major components of the project. The Chief Scientist is Academician D. Qin.

An experiment on watershed hydrology in the Hei'he River in Gansu Province was funded by the CAS and NSF-China. It includes synchronized satellite, airborne and ground-based observations and modelling of almost all components of the watershed consisting of alpine glaciers and permafrost, subalpine mountains forests and meadows, and piedmont steppes, farmlands in the

middle drainages, and downstream deserts and salty lakes. The lead scientist is X. Li, CAREERI.

A permafrost research project is underway related to the construction of a railway for the transportation of coal from Tianjun to Muli and from Chaidar to Muli in permafrost regions on the southern slope of the Qilian Mountains (on the northern edge of the Qinghai-Tibet Plateau) by Y. Sheng and H. Jin, the lead scientists from SKLFSE. Of the total 150 km highways from Tianjun to Muli, 60 km have continuous permafrost and 30 km discontinuous permafrost. The Muli to Jiangcang section (about 40 km of ice-saturated permafrost in wetlands) is not yet connected with the highway system in Qinghai Province. Although the planned railway largely parallels the highway, it traverses more permafrost areas due to the more strict constraints of route selection. Mean annual ground temperatures range from -1.0 to -0.5°C in discontinuous permafrost area and -1.5 to -1.0°C in continuous permafrost regions. The ground temperature in the Muli Basin is about -2.0°C.

Permafrost foundation engineering research for the 440 kW power transmission line from Golmud to Lhasa is underway for construction in winter 2008, with J. Zhang from SKLFSE as lead scientist. The major permafrost research is on the tower foundations in thaw-sensitive and frost-susceptible permafrost areas.

The Tibet Plateau Research Program (TiP) is funded by NSF-China and DFG, aiming at understanding land surface and interior processes and palaeoclimates and -environments, including periglacial and relict permafrost, degradation of permafrost and ecological and hydrological processes in cold regions. The lead TiP organizations on permafrost in China are CAREERI and the Institute of Tibetan Plateau Research.

Organizational change

The State Key Laboratory of Cryosphere Science was founded on the basis of the CAS Ice Cores and Cold Regions Environments. Its primary research foci are cryospheric science in China and in polar regions. Several stations for the study of cold regions hydrology and alpine permafrost in the upper Hei'he River, Gansu Province, were re-established on the basis of the research and monitoring in 1990s and for the need of watershed management research. A permafrost station in Muli, Qilian Mountains, was established for studying and monitoring changes of permafrost in wetlands and the environmental impacts associated with development of coal mines, which would be a major cold regions project during the next 25 years.

Meetings

The Sino-German Workshop on the Qinghai-Tibet Plateau research was held in Kun'ming, China, April 27-30, exchanging the latest developments on plateau geosciences. The majority of reports were on palaeo-reconstruction, including changes and evolution of permafrost and periglacial processes. A Symposium on the Qinghai-Tibet Plateau and Bordering Regions was held October 20-23 in Lanzhou, China, for exchange of recent development on plateau research in China. Permafrost studies in northeastern China and in Qinghai-Tibet were presented. The CliC conference, with a focus of Asian countries, was held in Lanzhou immediately afterwards.

Meetings on Strategic Positioning of CAREERI and SKLFSE were held in October. The foci were on strategic re-positioning of studies on permafrost engineering and cold regions environments, on organizing major domestic and international research projects on permafrost, and on re-organizing of research divisions in SKLFSE and CAREERI. It is concluded that permafrost changes and its environmental impacts in the sources of the Yellow River are very important, and will be strengthened within the next 5 to 10 years by organizing and conducting major research projects, and by establishing long-term monitoring stations using funding from NSF-China, CAS and CAREERI.

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DENMARK

The Zackenberg Basic monitoring programme in Zackenberg, Northeast Greenland, and the Geographical and the Climatic programmes (GeoBasis and ClimateBasis) have continued collecting data of climatic, hydrological and terrestrial variables describing the dynamics of the physical and geomorphological environment in this high Arctic location. GeoBasis is operated by the National Environmental Research Institute in co-operation with Department of Geography, University of Copenhagen, and ClimateBasis is operated by ASIAQ – Greenland Survey. Data from the monitoring programmes are summarised in the ZERO Annual Reports published by the Danish Polar Center. These can be downloaded at <www.zackenberg.dk/Data>. A synthesis of the first ten year monitoring and research results will be published by several of the involved scientists in 2008.

The Arctic Technology Centre (ARTEK: Sanaartornermik Iliniarfik in Sisimiut, Greenland / Department of Civil Engineering at the Technical University of Denmark) has continued its studies of permafrost related to roads and infrastructures in the

discontinuous to continuous permafrost regions between Sisimiut and Kangerlussuaq (Søndre Strømfjord). N. Foged and T. Ingeman-Nielsen, ARTEK have further developed the geological, geophysical and geotechnical mapping of the selected test sites and started a study of risk zonation of degrading permafrost in Ilulissat, Sisimiut, Kangerlussuaq and Nuuk as part of the NSF supported research programme *Recent and Future Permafrost Variability, Retreat and Degradation in Greenland and Alaska: An Integrated Approach*. The project partners are University of Alaska Fairbanks (V. Romanovsky and K. Yoshikawa), the Danish Meteorological Institute (J. H. Christensen and M. Stendel), ASIAQ (the Greenland Survey; K.H. Svendsen and R. Butzbach), and ARTEK (N. Foged and T. Ingeman-Nielsen). Test sites in Greenland and in Alaska were visited and instrumented. Reports related to the test sites at the airports of Ilulissat and Kangerlussuaq will be presented at the NICOP, including PhD student A.S. Jørgensen results of the on-going georadar investigations of the timely development of the active layer under dark asphaltic pavements and under white-painted surfaces in Kangerlussuaq Airport. The project results will be available at <www.asiaq.gl/permafrost>, which is under construction.

ARTEK arranged an International Conference on Arctic Roads in Sisimiut 3-5 March 2007. The topics were operation, maintenance, and construction of roads under Arctic conditions. Proceedings are available at <www.arktiskcenter.gl>.

The Danish IPA adhering body SAFT - Society of Arctic Research and Technology – carried on its cross-disciplinary outreach activities and support to MSc and PhD studies in Greenland, and maintain coordinating contact with the Permafrost Young Research Network (PYRN). Please contact S. Hanson (sha@spacecenter.dk) if any inquiries.

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FINLAND

The 8th International Symposium on Cold Region Development ISCORD 2007 took place in September 25-27, 2007 in Tampere, Finland. The symposium was attended by 183 participants from 14 countries, presenting 113 papers from 12 countries in 23 sessions. The symposium was arranged by the Finnish Society of Civil Engineers (RIL) and sponsored by the ASCE, the International Polar Year, the Technical Research Centre of Finland VTT, the International Society of Soil Mechanics and the Geotechnical Engineering / International Technical Committee on Frost, ISSMGE/ITC 8. In the symposium, a wide set of presentations dealt with various

aspects of living in environments with seasonal frost and permafrost, such as construction and maintenance of infrastructure, buildings, transport facilities, foundations, materials, as well as safety and environmental aspects, climate change, and education. ISSMGE/ITC 8 held its Committee meeting at the conference. The hosting IASCOR (International Association of Symposia on Cold Region Development), decided to hold the next ISCORD in Yakutsk, Republic of Sakha (Russia), in the summer of 2010. The symposium was attended by the President of RIL, J. Haapamaki, the President of ASCE, B. Marcuson, and the Honorary President of IASCOR, H. Sasaki.

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FRANCE

Permafrost and periglacial research activities were mainly conducted in several laboratories in France: GEOLAB (UMR 6042, CNRS-Clermont-Ferrand University), THEMA (UMR 6049, CNRS-Franche Comté University), M2C (UMR 6143, Caen University), IDES (UMR 8148, CNRS-Paris-Sud University) and SET (UMR 5603, CNRS-Pau University).

The periglacial group of the University of Caen continues to investigate the effects of climate warming on periglacial slopes. New experiments have been focused on the evolution of erosion processes and the changes in slope morphology, when water supply evolves as expected during climate warming.

The programme *Laboratory simulation of solifluction processes associated with one-sided and two-sided active layer freezing* from the Cardiff group lead by C. Harris is concluding. It provides new data on solifluction processes and soil behaviour in the presence of permafrost (see also the UK report).

The polar research group of the Laboratory of Physical and Environmental Geography of Clermont-Ferrand was involved in various activities of the periglacial community. Most of the fieldwork was carried out in Iceland, which is the main field area. The scientific collaboration between A. Decaulne and Þ. Sæmundsson, Natural Research Centre of Northwestern Iceland, Sauðárkrúkur, continued on periglacial dynamics impact on slopes in northwestern, northcentral and southern Iceland, with specific emphasis on slope processes, slope deposit stratigraphy and dendrogeomorphology, and on the survey of the patchy permafrost and active layer in the Icelandic highlands. A. Decaulne also cooperates with S. Conway, J. Murray and M. Balme, from the Open University, UK, in studying debris-flow landforms in northwestern Iceland, and comparing the morphological properties of



Physical modelling of slope morphology during climate warming at Caen laboratory. Photograph by G. Guillemet.

these slope landforms with those observed on the Mars surface.

Based on lab analyses by P. Bertran (INRAP-IPGQ, Bordeaux) and J. Arocena (UNBC, Canada), field observations previously carried out by M.-F. André and K. Hall (UNBC, Canada) on the Falklands “stone runs” resulted in the proposal of a new interpretation of these block streams. The different explanations suggested since Darwin, and during the past half-century, provide a good illustration of contemporary shifts in periglacial geomorphology. A more general historical overview of periglacial research, from the Climatic Geomorphology “golden age” to the current Global Change “fever”, was provided by M.-F. André at the joint periglacial meeting of the Geological Society of London and the Quaternary Research Association.

Research is also carried out on a glacier system of Svalbard. The objective of the Hydro-sensor-FLOWS project (IPY no. 16) is to investigate the hydrology of the Austre Lovénbreen glacier basin (Brøgger peninsula, Svalbard) by continuous monitoring in space and time of dynamics over a four-year period (2007-2010). The project is coordinated by M. Griselin (UMR Thema) and C. Marlin (UMR IDES) in association with SET (Pau) and FEMTO (Besançon). The main objective is to improve our understanding of the system response to contemporary climatic fluctuations (40 years). Different methods are used to study the glacier and its hydrology and its dynamics: image loggers (satellites and automatic

cameras on the ground), loggers recording meteorological data, air temperature at 30 locations in the basin and hydro-geochemical data. The mapping of the top of permafrost and the base of the glacier by GPR is carried out by AWI scientists. The thinning of the glacier Austre Lovénbreen between 1995 and 2007 is 40 m at the front. An analysis of the meteorological data of the Ny-Ålesund station (1969-2006) compared with the first results obtained with the temperature loggers located on the glacier indicate anomalously warm conditions on the glacier during the beginning of August (average value up to 10 °C), implying a very high rate of melting. During the winter 2006-2007, at least 13 positive “warm” events were observed. This would indicate that melting could occur over the whole glacier surface even during the polar night.

A detailed analysis of the hydrology of the Lena was performed by E. Gautier and D. Brunstein at the Laboratoire de Géographie Physique (Meudon) in cooperation with F. Costard (IDES laboratory, Orsay University), A. Fedorov (Permafrost Institute, Yakutsk) and D. Yang (University of Alaska, Fairbanks). Three major changes since the 1990s has been reported: a reduction of the river ice thickness in winter, a pronounced increase of the water temperatures in spring, and a slight increase of the discharge during the break up (May-June). Recent climatic change in central Siberia and its impact on the fluvial thermal erosion has been reported. A GIS analysis based on aerial photographs and satellite images highlights the impact of the water warming on the frozen banks. The vegetated islands appear to be very sensitive to the water temperature increase, showing an acceleration of their headward retreat (21 to 29 %).

Physical modelling of Martian gullies continues (F. Costard, UMR IDES 8148). Small gullies observed on Mars could be formed by groundwater seepage from underground aquifer, or may result from the melting of near surface ground ice at high obliquity. To test these different hypotheses, a laboratory simulation within a cold room was performed. The experimental slope was designed to simulate debris flows over sand dunes with various slope angles, and different granulometry and permafrost characteristics. Various laboratory simulations bring new constraints on the triggering of Martian flows. Preliminary results suggest that the typical morphology of gullies observed on Mars can best be explained by the formation of linear debris flows related to the melting of the near-surface ground ice within silty materials.

Current research concerning the performances of the WISDOM Radar (Water Ice and Sub-surface Deposit Observation on Mars) on the ExoMars rover mission (European Space Agency) are in progress at the Laboratory IDES (Orsay University) in cooperation with V. Ciarletti

(CETP). It concerns various simulations of the radar response to realistic geologic models of the Martian subsurface. The detection of discontinuities with a Ground Penetrating Radar (GPR) prototype is performed in a 0.7 m³ frozen soil in a cold room.

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GERMANY

Within the scope of the International Polar Year 2007/2008, an interdisciplinary expedition into the Prydzbay region (East-Antarctica) was carried out by the Alfred Wegener Institute (AWI) for Polar and Marine Research from early February to mid April (Chief Scientist: H.-W. Hubberten). A team of six scientists under the leadership of D. Wagner (AWI) worked for four weeks in the ice free areas of the Larsemann Hills and the Rauer Islands at the Prydzbay coast. The diversity and ecology of microbial communities, and their function in nutrient turnover were studied under extreme conditions in the Antarctic periglacial regions to identify the main microbial players in nutrient turnover. Soil and sediment samples were taken to analyze the micro-flora in relation to the important site characteristics such as hydrological, thermal and weathering processes. The acquired data will give an insight into the early stages of life on Earth, as well as the development of extreme habitats and the functioning of microbes within periglacial ecosystems.

The AWI permafrost investigations in the delta of the Lena River, Northeast Siberia, Russia were continued in July and August 2007, and included long-term methane emission rates of the wet polygonal sedge-moss-tundra showing the importance of the natural CH₄ source of permafrost affected soils (D. Wagner). The N-fluxes in permafrost soils and sediments were investigated by the University of Hamburg (E.-M. Pfeiffer). Additional soil science studies of the pedogenesis in the Alas depression on Kurungnakh Island were investigated in co-operation with PhD work at the Moscow State University (MSU).

The goal of the newly formed young investigator group SPARC (Sensitivity of *P*ermafrost in the *A*rctic), under the leadership of J. Boike (AWI), is to close the gap between the small-scale process understanding of energy and water fluxes, and the large-scale information from satellite remote sensing. Work was carried out at sites in Siberia (Lena Delta) and Spitsbergen (Ny-Ålesund) retrieving the following data sets: automated weather, soil, eddy covariance data, highly resolved surface images using digital cameras, and spatially distributed data on surface and radiation properties. Furthermore, spatially distributed hydrologic modelling is being carried out for these watersheds. Surface sediments from lakes recorders

of the modern Arctic environment serve as calibration data for palaeoclimate reconstruction using lake sediment cores. During a trip to the Anabar region in northwestern Yakutia, samples for diatom, pollen and geochemical analysis were taken along a typical temperature gradient from the tundra to the northern taiga (U. Herzschuh).

Following up the AWI Tibet seismic expedition of 2006, a 6.3 m long sediment core was taken from Lake Donggi Cona (Northeastern Tibetan Plateau) with the purpose of obtaining multi-proxy-data for climate reconstruction. Additionally, another core (4.5 m) was drilled at a lake close to Litang (Southeastern Tibetan Plateau). In both cases, drilling was carried out from the lake ice-cover. In addition, investigations for possible future campaigns were carried out in the Karlik Mountains, Northwestern China.

Funded by DFG (Deutsche Forschungsgemeinschaft) and CAS (Chinese Academy of Sciences), researchers from the Institute of Environmental Physics, University of Heidelberg (K. Roth) and from the Cold and Arid Regions Environmental and Engineering Research Institute (CAREERI), Lanzhou installed three automatic soil-meteorological stations at Zuimatan (55°22'N 99°09'E), Qumahe (34°54'N 94°48'E) and Cumarhe (35°11'N, 93°57'E) on the Qinghai-Tibet plateau in the summer of 2006. The installations were accompanied by extensive surveys of the permafrost table using ground-penetrating radar (GPR). These stations will provide continuous high-resolution data for studying (i) the general thermal and hydraulic dynamics of the warm permafrost along a climatic gradient and (ii) the impact of meteorological fluctuations on the consequences of



Geophysical monitoring of rock permafrost in a gallery near Zugspitze North Face (Germany/Austria) at 2770 m asl. Photograph by M. Krautblatter.

global change. Also during the summer of 2006, several sites in the Aksai Chin region in Western Tibet were explored applying GPR. This provided basic information to identify future sites where stations could be installed, and where more extensive geophysical explorations could take place.

Based on meteorological and soil temperature monitoring data compiled by the Department for Geography, Giessen University, in the Swiss Matter Valley, L. King and C. Maag investigated permafrost distribution between 3000 and 3400 m asl in the Gornergrat-Stockhorn region (Swiss Alps). They continued the monitoring of permafrost distribution, snowpatch patterns, geomorphological changes and mass-movement hazards. The climate change oriented research was supported by glaciological studies in the same area.

An interdisciplinary research project called *Water Resources in the Aksu-Tarim River Catchment (Xinjiang Autonomous Region, China) and the effects of Climate Change* was proposed by L. King (Giessen), H. Paeth (Würzburg), W. Hagg (Munich) and T. Bolch (Dresden), following a Chinese-German symposium in Urumqi. The regional water cycle within the framework of inter-related modules was researched, addressing atmospheric, cryospheric and hydrospheric processes. Within the cryosphere module, the regional permafrost distribution and active layer dynamics were of particular interest.

At the Department of Physical Geography, University of Würzburg, C. Kneisel is continuing surface temperature monitoring and geophysical permafrost characterization in the Swiss Alps, central Iceland and northern Sweden. In the Swiss Alps subsurface temperatures are monitored within two boreholes in the periglacial zone, and within one newly drilled borehole in the Bever valley at a sporadic permafrost site. Here, extensive geophysical mapping (2D electrical resistivity imaging and 2D refraction seismics) was carried out together with D. Schwindt to map the extent of small permafrost lenses. Geoelectrical monitoring of permafrost characteristics and active layer thickness was continued in the Muragl glacier forefield regularly during the summer months.

Permafrost research at the Department of Physical Geography of the University of Bonn focuses on geomorphic surface characteristics, sediment budgets, and the understanding of permafrost-affected transitional systems in rock walls, rock glaciers and glacier forefields. In his PhD thesis Otto (2006) used geomorphic mapping, geophysical sounding and mathematical base level extrapolation to quantify paraglacial sediment storage in the Turtmann Valley (Valais, Switzerland). Attention has been paid to the understanding of short-term and long-term nonlinear processes in transitional systems (Dikau, 2006; Krautblatter and Dikau, 2007).

Bedehäsing et al. (2007) compared the applicability of different geomorphic mapping systems to permafrost-affected glacier-forefields in the Matter and Turtmann Valleys (Swiss Alps). Otto et al. (2007) discussed multi-purpose application of HRSC-A datasets for the investigation of periglacial landforms. Krautblatter and Hauck (2007) introduced an approach to derive 2D-spatial information on permafrost distribution in rockwalls with the aid of electrical resistivity tomography. Krautblatter et al. (2007) also provided 3D insights into rock permafrost distribution and spatial variability using 2D/3D refraction seismics and 2D/3D electrical resistivity measurements in the Swiss Alps (Turtmann/Matter Valleys) and the German Alps (Zugspitze). This dataset was also used to support the planning of the Zugspitze Permafrost Borehole by the Bavarian Government. From 2006 to 2007 a wireless sensor network was tested in the Turtmann-Matter Valleys, providing online access to insolation, rock and air temperatures in different aspects (<www.sensorgis.ch>). Rock permafrost monitoring and permafrost-induced rock movements will be studied as part of the forthcoming research project *Sensitivity of Mountain Permafrost to Climate Change* (SPCC).

Initiated by the European Polar Board, German activities within the International Polar Year 2007/08 will include the programme 'Cool Classes', addressing teachers of all geo-sciences. School teachers will be able to participate directly in international scientific projects and expeditions, and develop concepts for in-class science projects in marine and terrestrial sciences, including permafrost topics by using both a theoretical and practical approach. As the polar regions are not yet represented in the school curricula, the concept 'Cool Classes' will be utilized in order to establish long-term partnerships between school groups and scientific institutions in Germany (<www.polarjahr.de/coole-klassen.155.0.html>, project coordinator: rainer.lehmann@gmx.net).

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ICELAND

Cryoturbation is very active in Iceland due to frequent freeze-thaw cycles in the oceanic sub-arctic climate, and most soils and land surfaces show some geomorphic surface features that result from frost activity. The scientific collaboration between A. Decaulne and Þ. Sæmundsson, Natural Research Centre of Northwestern Iceland, Sauðárkrókur, continued on periglacial dynamics on slopes in northwestern and northcentral Iceland, with specific emphasis on slope processes, slope deposit

stratigraphy, dendrogeomorphology, and on the survey of the sporadic permafrost in the Icelandic highlands. Among other current activities are the continued measurements in the Orravatnsrustir palsa area north of Hofsjökull (Náttúrustofa Norðurlands Vestra and Agricultural University of Iceland (AUI) in co-operation with other partners). Three years of data from Orravatnsrustir indicate very dynamic surface processes and permafrost thickness exceeding six. The Agricultural University continues its research on the formation of soil ice and its characteristics in desert ecosystems and on frost effects on microbial biomass in Icelandic Andosols in cooperation with University of Aberdeen. Iceland also participates in the ITEX Arctic research programme, under the leadership of I.S. Jónsdóttir (AUI) and co-workers.

The polar research group of the Laboratory of Physical and Environmental Geography of Clermont-Ferrand (GEOLAB–UMR 6042-CNRS) has been involved in various activities of interest to the periglacial community. Most of the fieldwork has been carried out in Iceland which is the main field area currently investigated by the GEOLAB team. H. Farbrót and co-workers recently published a paper on the first quantitative description of mountain permafrost obtained from four high altitude boreholes. Data loggers continue to obtain ground temperatures in these boreholes (B. Etzelmüller, T. Eiken, H. Farbrót, A. Gudmundsson).

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ITALY

During the past year the Italian scientific community was mainly concentrated on research in the Alps as a major financial reduction of the Antarctic funding did not allow any scientific fieldwork. Only permafrost, active layer and ice-wedge monitoring was continued in the Antarctic. In the Alps, several investigations were conducted by different research teams with the support of national, local and European funds.

In particular, a multidisciplinary work on the Schiantala rock glacier (Western Alps), with geomorphological and geophysical methods combined with analyses of ice structure and fabric, along with age control, were used to understand the genesis of landforms in an environment, where glaciers and permafrost interact. The results show that in rock glaciers developed in recently deglaciated areas, i.e. those occupied by LIA glaciers, sedimentary and congelation ice can coexist, and that the existence of pre-existing permafrost influenced by glacier advance must be taken into account.

Also the research on the Foscagno rock glacier (Central Italian Alps) continued with the isotopic analysis of the



AIGEO field trip at Stelvio PACE borehole station (3000 m asl). Photograph by N. Cannone.

ice cores obtained some years ago, supported by ^{14}C ages achieved by dating some leaves embedded in the ice. In addition, a new campaign of electrical tomography was carried out by Insubria and Pisa University research groups, to compare these new data with the DC resistivity soundings and electrical tomographies carried out 15 and 5 years ago and thus to detect possible modifications of the active layer and permafrost in response to climate change. N. Cannone and M. Guglielmin suggested the possible influence of permafrost degradation on the unexpected vegetation regression above 2,600 m asl in the Stelvio area. Also the permafrost monitoring programme continued in Upper Valtellina, both within the Foscagno rock glacier and Stelvio borehole. In addition a snow-permafrost-vegetation monitoring on a grid site (51 test points in an area of 0.4 km²) was established by a joint effort of Ferrara University (N. Cannone), Insubria University (M. Guglielmin), and Bicocca University (S. Sgorbati). The Pisa group started research on the geographic and morphometric characteristics of the block fields in the Argentera Massif (Western Alps). Moreover, in a site (Rocca dell'Abisso), the temperature at different depths was recorded hourly on differently orientated slopes of the same block field.

R. Seppi and A. Carton (Univ. Pavia and Padova, respectively) continued their monitoring of rock glaciers dynamics and regimes of water springs. Milano University (M. Pelfini) and Insubria University (M. Guglielmin) in summer 2007 started a project which analyses permafrost and water circulation in a bedrock slope. All these investigations have been supported by the funded PRIN 2006-07 project *Disintegration of Alpine glaciers and dynamics of deglaciated areas in the Maritime and Central Alps*.

An important INTERREG European project named

'PERMAdataROC', partially developed by the Italian community, started in March 2006 and will end in March 2008. From Italy Fondazione Montagna Sicura, ARPA Valle d'Aosta (Operational Area - Climatic Changes) and CNR-IRPI of Turin participates. This project tests new methods to monitor the thermal regimes of rockwalls in high mountain areas affected by gravitational movements, and creates a database. Actually PERMAdataROC project is investigating two western Alpine areas, the Mont Blanc massif and the Matterhorn, through

a) creation of a database of rockfalls occurring on the Italian side of the Mont Blanc massif at elevation greater than 2000 m asl (the database will be updated by Alpine Guides, who are specifically trained to fill a survey form describing expected future events),

b) monitoring the thermal regime of the rock faces of seven sites (with a total of 28 loggers installed) at the depth of 3, 30 and 55 cm. In addition climatic conditions are monitored measuring air humidity and temperature, net radiation and wind direction on the two mountains,

c) monitoring of the morphological activity of rockwalls with frequently repeated surveys (LIDAR) and terrestrial photogrammetry.

The national summer field trip of the Italian Geomorphologist Association (AIGEO) was organized by M. Guglielmin (Insubria University) and N. Cannone (Ferrara University) visiting the Foscagno and Stelvio sites. At the same meeting the past IPA President H.M. French presented a lecture on the changes of the periglacial geomorphology in the last century. The meeting was sponsored by Insubria University and Micros+Siap srl.

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JAPAN

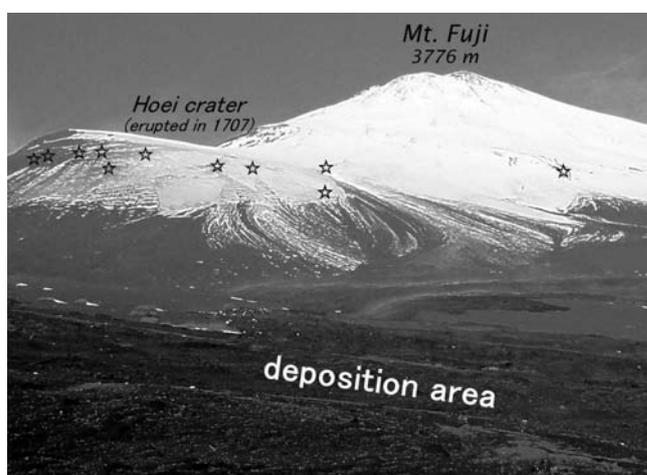
In Alaska, the project *2004 Forest Fire Impacts to Hydrological Cycles, Permafrost and Eco Systems in Central Alaska* has continued since 2005 to monitor permafrost conditions after a severe wildfire (M. Fukuda, K. Harada, Y. Sawada, K. Narita, and M. Ishikawa). In the summer of 2007, observations were carried out at Poker Flat near Fairbanks in July and August and at Kougarok near Nome in August. The observations included electrical soundings and pit surveys for monitoring active layer conditions, and vegetation surveys. The active layer thicknesses increased in the 2007 summer. Comparing the data for the last three years, the thermal condition in the active layer will be estimated and the effect of the wildfire on the permafrost condition and vegetation recovery will be clarified. In June 2007, rock glaciers in the Brooks Range were also studied (A. Ikeda). The distribution, structure

and thermal conditions of the rock glaciers, investigated in the arid part of Alaska, were compared with those in relatively warm and humid mountains, to clarify the environments indicated by rock glaciers.

The Japan-Norway joint project has continued in Svalbard since 2004 (N. Matsuoka, A. Ikeda, M. Ishikawa, T. Watanabe, H.H. Christiansen and O. Humlum). In the summer of 2007, data on several periglacial processes (ice-wedge cracking, rock weathering and rock glacier creep) were collected from the model experimental sites in Adventdalen. The monitoring network was further expanded to the Kapp Linné area, to compare periglacial dynamics between inland (Adventdalen) and maritime (Kapp Linné) situations. GPR sounding was also undertaken on the polygonal ground in the two areas, to distinguish polygons with ice-wedges and those with only active-layer soil wedges.

In the Daisekkei Valley (a Pleistocene glacial trough), northern Japanese Alps, the present-day rockfall activities were investigated to produce a geohazard map for safe recreation (Y. Kariya, J. Komori, T. Kawasaki, Y. Matsunaga, K. Mokudai, Y. Miyazawa, M. Ishii, G. Sato and S. Iwata). The location, size and lithology of all debris deposited on perennial snowpatches in the valley floor were determined monthly from May to November 2006, and the debris production rates were computed. Snow ablation, precipitation and rock temperatures were also monitored. Preliminary results were presented in the journal *Landslides* (Kariya et al.) and in the 2006 AGU fall meeting (Kawasaki et al.).

In the alpine and subalpine zones of the northern Japanese Alps, geology and geomorphology of landslides were investigated by a combination of fieldwork and laboratory analysis (G. Sato and Y. Kariya). The landslides were mapped using aerial photographs and DEM-generated shaded maps. The timing of landslides was determined by



Slush flows on the eastern slope of the Fuji volcano, which occurred on February 14, 2007. The stars indicate the starting points. Photograph taken on February 17, 2007 by J. Komori.

volcanic ash deposits and ^{14}C ages. Part of these features may have been associated with deglaciation or permafrost thawing during or after the Lateglacial period. New depression (sagging) features have also been monitored with extensometers in an alpine area of the southern Japanese Alps, following a rock slope failure during the thawing period of 2004 (R. Nishii, N. Matsuoka and A. Ikeda).

The Japanese highest mountain, the Fuji volcano (3776 m asl), has steep, slippery upper slopes. During warm periods in winter and early spring, rainfalls often trigger snow-debris avalanches at around 2500 m asl, which move downslope as rapid slush flows until reaching 1300 m asl (see photo). Detailed field investigations in the winter of 2006-2007 showed that the seasonal frost table within loose volcanic materials acted as a slip plane that released a snow-debris avalanche: the debris volume reached 10^5 m^3 per event (J. Komori, S. Anma, K. Honda and T. Hiishi).

The colloquium on cryosphere geo- and bio-sciences in Japan held three scientific meetings in Tokyo. The colloquium also hosted two field workshops on active patterned ground in the Ou Mountains and on relict blockfields in the Kanto Mountains (Leader: M. Seto).

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KAZAKHSTAN

The Institute of Geography (Ministry of Education and Science, Republic of Kazakhstan) has continued monitoring snow cover and glaciers at three mountain stations on the northern slope of Zailiyskiy Alatau (Northern Tien Shan). Monitoring stations are located at 3500 m (Glacier Tuyuksu), 2550 m (Big Almaty Lake) and 3400 m asl (Zhusaly Kezen Pass). At the special snow survey test area the series of experimental sites were established at the different altitudes and exposures, and vegetation types. The maximum snow-water equivalents are measured. Measurement results are used for calculating snow cover characteristics using remote sensing data. It is possible to calculate the maximum snow resources (as snow-water equivalent) for any mountain site using data of remote sensing, a method of thermal imaging of snow cover, and a topographical model of the area.

Comparative studies of dynamics of glaciations in the Zailiysko-Kungeiskiy and Dzhungarskiy glacial systems in comparison with similar research on world mountain areas were completed. This shows that glaciations of the Central Asian mountains (Dzhungarskiy Alatau, Tien Shan, Pamirs, Gissaro-Alai) developed synchronously over the last decades, and remained in conditions of

degradation. The maximum rates of the reduction of glaciation of the Zailiysko-Kungeiskiy and Dzhungarskiy glacial systems (about 0,8% per year on the open part of glaciers and about 1% per year on the volume) were observed in the middle 1970s. However, from the beginning of 1980s they were reduced significantly and remained rather constant up to 2004-2005. According to prognostic estimations, glaciation of the region can be reduced by the end of the current century by no more than one third. It was also shown that despite significant degradation of glaciers, the average values (norms) of runoff of the main rivers of the region (Syr Darya, Amu Darya, Ili, Irtysh, etc.) remained stable for at least the last 70-80 years. For the same period the norms of the annual and seasonal sums of atmospheric precipitation and maximum snow resources practically have not changed. All this give reason to assume a certain compensation mechanism, which is expected to be increasing contribution to runoff from melted ground ice, including ice accumulated in perennially frozen ground.

Kazakhstan alpine geocryological laboratory of the Institute of Permafrost, Siberian Branch of the Russian Academy of Sciences, continued monitoring perennial and seasonally frozen ground and active layer in Northern Tien Shan. The studies of the temperature regime of the ground are carried out year-round at the network of permanent sites established in different landscapes, taking into account absolute altitude, exposure, structure of the ground and type of vegetation.

Temperature observations of perennially frozen grounds were carried out in the sub-belt of sporadic permafrost at 3320-3340 m asl. Data from monitoring in 2007 indicates further stabilization of the temperature starting in 1995, and with insignificant fluctuations around -0.2°C . Since 2002 the depth of the active layer varies around 4.5 – 5.0 m. Long-term monitoring of the temperature regime and depth of seasonal freezing of the ground continues in different landscapes of the Zailiyskiy Alatau mountains and on the foothill plain. The 2007 studies confirm an unequal response of the changes in the depth and temperatures of seasonal freezing at different absolute altitudes to climatic changes. In low mountains, where the depth of freezing is insignificant and has large multiyear fluctuations, the obvious trends were not found during the 33-year period of observations. In mid-mountains (1400-2700 m asl) the trend towards reduction of the depth of freezing on slopes of different exposures was recorded until 2002. Since 2003 the depth of freezing stabilized and fluctuated insignificantly. Above the upper forest line strong winds lead to snowdrifting and dense snow conditions. This condition promote deeper ground freezing. In this zone at 3000 m asl, even with a reduction of snow over the past four years, a tendency of increasing depth of seasonal freezing on the slopes of different

exposure was found. At the altitudes at 3320-3340 m asl this tendency is more evident. The big difference in the depths of snow cover on windward and leeward slopes determines distinction in the depths of freezing by 2-3 times.

Studies of new cryogenic forms on fresh moraine deposits continue. Transformation of subglacial moraines into subaerial ones causes changes in the character of cryogenic relief forming, and new processes and phenomena appear. Among them thermokarst, lakes of various genesis, thermoabrasion, solifluction processes, ice mounds, structural grounds, cryogenic landslides, rock glaciers and glacial mudflows are especially notable.

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MONGOLIA

Since 1996, CALM and GTN-P programs in Mongolia were continued by N. Sharkhuu in close collaboration with F. Nelson and N. Shiklomanov from University of Delaware. At present, there are 44 CALM sites and GTN-P boreholes in Mongolia. Most of the boreholes are located in the Hövsgöl and Hentei mountain regions. Seventeen boreholes are equipped with temperature dataloggers. Initial data on continuous temperature measurements and movable thermistor strings in all the boreholes were compiled by Sh. Anarmaa and included in international permafrost databases. Some results on permafrost monitoring in Mongolia were published in the JGR journal (Sharkhuu, A., et al, 2007).

The Mongolian IPY Expression of Intent no. 1129 is the main components for CALM and GTN-P programs in Mongolia, as part of the Thermal State of Permafrost IPY Project 50. Accordingly, in 2007 we carried out the following activities: 1) In the Hangai mountain region we drilled four, 10-15 m deep boreholes adjacent to old ones that were investigated 25-35 years ago. Next year we plan to drill 2-4 boreholes in the Altai mountain region; 2) To improve the borehole measurements, we increased the number of temperature dataloggers in the boreholes, calibrated logger sensors and thermistors; 3) To extend observations at six borehole sites near Ulaanbaatar we measured plant biomass and soil moisture content at depths of 0.1-0.3-0.5 m monthly during the summer and thickness and density of the snow cover monthly during winter. At other monitoring sites we measured plant biomass and soil moisture in September and October; 4) In respect to the new generations of permafrost researchers, we have good contact with PYRN. Sh. Anarmaa defended her MSc

thesis and continues her studies on permafrost. Jambaljav has prepared his PhD thesis on mapping and modelling the distribution of permafrost in the Ulaanbaatar area.

Within the framework of the IPA project on mapping and modelling of mountain permafrost in Central and Eastern Asia, N. Sharkhuu and Sh. Anarmaa prepared catalogues of data from more than 100 geocryological boreholes, with mean annual permafrost temperature measurements at a depth of 10-15 m, and also from more than 100 hydrogeological boreholes with permafrost in Mongolia. We studied and established values of regional changes in mean annual ground/permafrost temperatures depending on altitudes, latitudes, slope aspect, vegetation and snow covers, ground texture and moisture content, rockfall and groundwater. The values of the ground temperature regime are the main parameters for mapping and modelling distribution and thickness of permafrost. The main results of these studies will be presented in our paper for NICOP.

The joint Japanese and Mongolian LORGC project continues for its sixth year in the Nalaikh and Terelj areas. Researchers are conducting long-term observations for studying changes in climate, soil thermal and hydrologic conditions. In addition, Japanese, Chinese and Mongolian researchers have organized to implement a project on Integrated Environmental Monitoring at another site in the Terelj area, located about 50 km northeast of Ulaanbaatar. The project includes long-term observations for studying mechanisms of permafrost degradation under the influence of recent climate warming. In this connection, two, 20 m deep boreholes for permafrost monitoring were drilled and equipped in a valley bottom and on a north-facing slope of the study area.

Within the framework of permafrost monitoring in Mongolia, we have started to collaborate with K. Yoshikawa from University of Alaska Fairbanks. He visited Mongolia for a week in May and provided us with eight HOBO U-12 dataloggers with sensors on cables. Our collaboration of permafrost monitoring is presently with school students from Nalaikh and Terelj villages near Ulaanbaatar. This collaboration will be extended next year.

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THE NETHERLANDS

Research on carbon and water exchange of taiga and tundra ecosystems in eastern Siberia was undertaken in cooperative projects of the Institute for Biological Problems Cryolithozone (IBPC), Siberian Branch, Russian Academy of Sciences in Yakutsk and the Vrije

Universiteit (VU) in Amsterdam (Department of Hydrology and Geo-Environmental Sciences). In a larch/birch forest near Yakutsk (Spasskaya Pad Field Station) and on a tundra site near Chokhurdakh in the Indigyrka lowlands (Kytalyk reserve) flux measurements were made with eddy correlation towers. From 2004 onwards, this research was extended with measurements of methane fluxes and a survey of active layer thickness and temperature. The aim is to estimate the annual exchange rates and their interannual variability, and to determine the sensitivity of the fluxes to environmental factors.

The 2005 and 2006 campaign was funded by the Vrije Universiteit and NWO (Dutch Organization of Scientific Research) and is a continuation of research in the EU TCOS (Terrestrial Carbon Observation System) project. Starting in autumn 2006 this research continues for three years as a Darwin Centre for Biogeology project (NWO funded) in cooperation between VU Amsterdam, University of Utrecht (Palaeoecology) and Wageningen University (Vegetation Ecology). This resulted in joint fieldwork at the tundra site in the summer of 2007, including a methane flux measurement campaign on tundra and floodplain environments and on thermokarst lakes, establishment of vegetation-ecological experiments and sampling of lake bottom sediments for palaeo-ecological research. A site was established for long-term monitoring of active layer thickness.

In 2007, VU Amsterdam and IBPC received a grant from the Dutch-Russian Scientific Cooperation Fund to establish a more permanent research facility at the tundra site that will provide a longer time series of carbon exchange data, hydrology and permafrost dynamics. Contact K. van Huissteden (ko.van.huissteden@falw.vu.nl).

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NEW ZEALAND

In January 2007 M. McLoed of Landcare Research, along with J. Aislabie (Landcare Research), M. Balks (University of Waikato), and J. Bockheim (University of Wisconsin Madison), completed the third field season for McLoed's PhD study undertaking soil mapping, and developing a vulnerability index for soils in the Wright Valley of Antarctica. M. Balks, with assistance from L. Adlam (University of Waikato) and C. Seybold (USDA) installed temperature dataloggers in the two, 30m boreholes (one at Marble Point and one in the Wright Valley) that were drilled in the summer 2005-06 in collaboration with M. Guglielmin from Italy. The thrust of the Landcare Research Antarctic soil programme over the next two years is to focus on data write up and



F. Baio (Italy) and C. Burgess (New Zealand) drilling permafrost borehole at Marble Point, Antarctica. Photograph by M. Balks.

maintaining and downloading the soil climate stations.

Three New Zealanders (M. Balks, G. Claridge and W. Dickinson) attended the ANTPAS meeting held in conjunction with the International Symposium on Antarctic Earth Sciences at Santa Barbara in California in August 2007.

Two young researchers from New Zealand have submitted logistic applications to the Antarctica New Zealand programme to undertake PhD studies relating to Antarctic soils and permafrost. They are F. Shanahun from Lincoln University to study of pedogenic carbonate to determine past soil climate, and T. O'Neill (University of Waikato) to study the effectiveness of the current EIA system at predicting cumulative effects and rates of recovery of human impacts on Antarctic soils. We wish them both well with their applications.

L. Adlam (University of Waikato) is commencing a MSc study, in which she will undertake the first comprehensive analysis of the soil climate data from the NZ/USDA soil climate stations that have been operating, collecting 69 data parameters, from each of the seven meteorological stations, on an hourly basis for up to eight years. Adlam will also be working in collaboration with C. Seybold (USDA) in her study, will travel to Antarctica this summer to help download the data, and to undertake maintenance on the borehole dataloggers.

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NORWAY

TSP NORWAY IPY project activities

The Norwegian IPY project *Permafrost Observatory Project: A contribution to the thermal state of permafrost in Norway and Svalbard* (TSP NORWAY) officially started on March 1, 2007, as part of the international IPY TSP cluster project. The main objective is to measure and model permafrost distribution in Norway and Svalbard, focussing on its thermal state, thickness and associated periglacial processes, including increased knowledge of mountain permafrost distribution related to rock-slides and other geohazards. The project is funded by the Norwegian Research Council, and 17 scientists and PhD students from seven institutions, companies and research centres in Norway are involved. TSP-Norway project coordinator is H.H. Christiansen, the University Centre in Svalbard (UNIS). Participating institutions are the Department of Geology (UNIS), Department of Geosciences (University of Oslo), Norwegian Geological Survey (NGU), International Centre for Geohazards (ICG), Norwegian Meteorological Institute, Norwegian University of Science and Technology (NTNU), and Opticon Instanes Svalbard. A website (<www.tspnorway.com>) was launched with information on ongoing research activities.

During spring and summer 2007 fieldwork was started in Troms and Finnmark (northern Norway) and in Svalbard. Nine new boreholes have been drilled by the NGU drillrigg, and instrumented for thermal monitoring at mountain sites in Troms and Finnmark. Periodic recalibration of the installed thermistors is possible and the holes remain accessible for other probes in the future. Monitoring sites for measuring movement of rock glaciers and solifluction sheets have been established at Kapp Linné and in the Longyearbyen area, Svalbard. Data will be reported to the first Norwegian Permafrost

database NORPERM, located at NGU. TSP-NORWAY hopes to establish a northern Scandinavia Permafrost Observatory extending into Finland and Sweden during IPY in collaboration with Finnish and Swedish colleagues, and of increased collaboration with Polish and Russian permafrost scientists in Svalbard. H. Juliussen is a TSP NORWAY post. doc., working with periglacial process monitoring, based at UNIS in Svalbard, and database management at the NGU.

Norwegian Meteorological Institute activities

Data was collected in Jotunheimen, southern Norway, temperature data from the Juvvasshøe PACE borehole (established in 1999) and in Svalbard data from the Janssonhaugen PACE borehole (established in 1998). Collection of the temperature data from the PACE boreholes is organized in a long-term monitoring programme for climatic research. The programme is run by the Norwegian Meteorological Institute (K. Isaksen) and the national databases are linked to the GTN-P database.

On Dovrefjell, southern Norway, temperature data were collected from 11 boreholes (9 m deep) along an altitudinal transect across the mountain permafrost transition zone as described earlier in *Frozen Ground*. The objective of the study is to model the trend and variability of mean annual ground temperature (MAGT) and to evaluate the influence of the snow cover on mean annual ground surface temperature (MAGST) in a high mountain terrain (R.S. Ødegård, K. Isaksen, T. Eiken and J.L. Sollid). In the same field area data from temperature data loggers were collected as part of a Norwegian monitoring programme for palsa peatlands, co-ordinated by the Norwegian Institute for Nature Research (A. Hofgaard, K. Isaksen, J.L. Sollid, R.S. Ødegård, H. Farbrot and T. Eiken).



TSP Norway participants meeting in the Norwegian Meteorological Institute, Oslo, autumn 2007. Photograph provided by H.H. Christiansen.

In the Møre and Romsdal area, southern Norway, and in the Troms and Finnmark areas, northern Norway, temperature data are collected as part of a permafrost and climate monitoring project co-ordinated by NGU and with the Department of Geosciences on the instability of rock slopes in Norway as described earlier in *Frozen Ground* (K. Isaksen, L.H. Blikra, T. Eiken and J.L. Sollid).

Geology Department, UNIS activities

Permafrost and periglacial studies at the Geology Department at UNIS (H.H. Christiansen, O. Humlum, L. Kristensen, H. Juliussen and J. Ellehauge) centre around various basic types of field data related to snow cover dynamics, geomorphic activity and active layer and permafrost borehole temperatures in the Longyearbyen and Adventdalen valleys, and surrounding mountains. All field data are available for research and education. In northern Norway and on Svalbard, A. Prick continued research on rock temperature monitoring and weathering processes across Troms, in cooperation with UNIS.

A new project *Climate change effects on high arctic mountain slope processes and their impact on traffic in Svalbard* (CRYOSLOPE Svalbard) was started January 1, 2007, funded by the Norwegian Research Council, under the Norklima initiative. Cold mountain slopes are studied along the 40-km main summer and winter transport routes in and around Longyearbyen, Svalbard. The response to projected future climatic changes is investigated, by combining investigations of past geological and geomorphological studies of slope process activity with monitoring of modern active slope processes and meteorology in the slope areas.

Collaboration between N. Matsuoka (Univ. Tsukuba, Japan) and H.H. Christiansen on ice-wedge and solifluction dynamics continued in Adventdalen, and was extended to the Kapp Linné site (west coast of Spitsbergen), including the Japanese MSc student T. Watanabe studying ice-wedge dynamics at both sites. Collaboration on collection of field data from two experimental sites for measuring soil creep in Adventdalen with A. Lewkowicz (Univ. Ottawa, Canada) was continued, as was collaboration on the operation of the solifluction station operated by C. Harris (Univ. Cardiff). Thermal conditions of ice-cored moraines deposited by late Holocene surges of the Paulabreen Glacier are investigated by L. Kristensen (UNIS) by means of several boreholes, geoelectrical resistivity and aerial photogrammetry.

The content of ice in the top permafrost will be investigated as part of the 2007-2008 *Longyearbyen CO₂ reservoir assessment; pilot study of possibilities and geological challenges project* (H.H. Christiansen and O. Humlum) using the SINTEF and UNIS new drillrigg. A 850 m

deep borehole has been drilled by the coal mine company Store Norske close to sea level in this project in the Longyearbyen area, and the temperature logged by NGU, showing shallow warm permafrost. This project is coordinated by A. Braathen, Geology Department UNIS.

Department of Geosciences, University of Oslo activities

In Troms, follow-up investigations to measurements from the early 1990s by J. Tolgensbakk were started in summer 2006 on the Sannjarriepi rock glacier, Nordmannvikdalen. The rock glacier lies on the western slope of a 1207 m asl high peak and is situated between 580 and 780 m asl. Previous velocities were determined by terrestrial surveying. Average values for the last 17 years are in the range of a few mm/year. While the rock glacier could still be regarded as "active" during the early 1990s, recent terrestrial survey, geophysical measurements (2D ERT) and MAGST temperature measurements (2006-2007), indicate that today, the rock glacier is in a transitional state from active to inactive, or already virtually inactive. Samples for exposure dating were taken on two conspicuous ridges and at the front of the rock glacier and laboratory preparation of the samples is under way (R. Frauenfelder, H. Farbrot, and J. Tolgensbakk).

In southern Norway, research since 2004 on mountain meteorology, snow cover, vegetation, ground temperatures and the interaction between permafrost and glaciers continues and was further extended by new sites in the Rondane Mountains (O. Humlum, H. Juliussen, K.S. Lilleøren, and M. Ferbarlein). The project covers a transect across southern Norway, ranging from maritime environments at the west coast (Sognefjorden - Ålesund) to continental regions near the Swedish border (Femunden - Trysil). Data are obtained by geomorphological mapping, dataloggers and automatic cameras, and are used for ongoing development and validation of a numeric active layer and permafrost models (O. Humlum).

H. Farbrot defended his PhD thesis *Distribution, thermal regime and geomorphic significance of mountain permafrost in northern Europe – examples from Iceland, northern Norway and Svalbard* at the University of Oslo in March 2007. H. Juliussen defended his PhD thesis *Near-surface ground thermal regime in permafrost areas of Norway and Svalbard: Processes and geomorphic implications* at the University of Oslo in June 2007.

NTNU Department of Geography activities

At the north-west coast of Prins Karls Forland, Svalbard, the existing geodetic network on rock glaciers was re-measured in August 2007 by I. Berthling and J. Wasrud, and A. Kääb (Univ. Oslo), following up previous measurements 1996-2000. First results indicate horizontal surface displacements in the order of 2-3 cm/year,

similar to those measured earlier. At the same time, 2D resistivity soundings were performed on three of these rock glaciers, complementing earlier 1D resistivity and GPR soundings. Special markers were installed to investigate the movement mechanisms of two rock glaciers. During the same field campaign, a measurement series on stone circles at Kvadehuksletta was started using close-range digital photogrammetry methods. The projects were funded by the Svalbard Science Forum and supported by UNIS.

NTNU, SINTEF and Arctic Technology Department, UNIS research collaboration

Increasing focus on oil and gas exploitation, and also on the consequences of climate change in the Arctic region, cause a demand for sustainable and environmental friendly construction methods, durable in harsh Arctic conditions with permafrost, heavy ice loads and strong currents. Scarce availability of high quality construction materials such as gravel and bedrock, strongly limits the use of conventional shoreline protection techniques. In response to these challenges, SINTEF Building and Infrastructure and The Norwegian University of Science and Technology, NTNU, together with The University Centre in Svalbard, Department of Technology, UNIS, the coal mining company SNSK and several industrial partners have ongoing projects investigating the potential of using geosynthetics as a mean of shoreline and erosion control measures in the Arctic. This work aims at developing new products, structural solutions and construction techniques and includes laboratory tests, numerical analyses and a full-scale test field.

Two field test sites are located in the coal mining community Svea in Svalbard. With its position Svalbard is very representative of the conditions along the shorelines towards the Barents Sea. Geotextile bags, made of different fabrics and filled at site with locally available material, are placed protecting an embankment and quay structures where heavy ice loads and strong currents and waves occur. The experiences so far have been very promising.

The PhD study by E. Caline, supervised by L. Grande at NTNU/UNIS, is a major part of the research project involving geosynthetics in Arctic erosion control. MSc students at NTNU/UNIS are currently also involved in collecting and organizing existing ground investigation data from Longyearbyen, and to use georadar in detecting ice formations in the permafrost, and this summer a student also performed a comparative study of temperature measurements from Svalbard. UNIS and SNSK cooperates with respect to avalanche mapping and avalanche protection in Longyearbyen proper, around coal mine no. 7 as well as in the Svea area.

SINTEF and NTNU will also focus on soil

investigations in the Arctic and other cold regions with permafrost. SINTEF has recently, with financial support from the Norwegian oil company Statoil, procured a geotechnical drill rig, which is in Svalbard for use in research projects for SINTEF, NTNU, UNIS and others. A core sampler, made at NTNU, is able to take high quality samples of fine-grained sediments with permafrost. The drill rig has been used together with georadar and other geophysical methods to map permafrost, a research project which continues.

The association of Cryosphere research in Norway, CRYONOR

CRYONOR, the network of Norwegian cryosphere scientists held the 2007 meeting, September 19-22, in Folldal. Excursion focus was on the large ice-dammed lakes existing in this part of Norway during the Late Weichselian, and how glaciers and permafrost controlled these huge water bodies. On March 27 CRYONOR organized a one-day seminar at the Department of Geosciences, University of Oslo, entitled *Climate change and the terrestrial cryosphere of mountainous and arctic regions* with invited keynote talks by C. Burn and W. Haeberli. The CRYONOR webpage (<www.cryonor.org>) has more information.

Education and outreach

A new AG-330 'Permafrost and Periglacial Environments' course was run for the first time for four weeks starting in



Geotechnical sampling of permafrost close to Longyearbyen, Svalbard. Photograph by J. Finseth.

IPA-PYRN-IPY 2007 Outreach Activities



2007 PYRN awards at the International Conference on Permafrost, Salekhard, June 2007. From left to right: P. Zubel (in the middle), from the Nicolaus Copernicus University in Poland; V. Stakhov (left), Institute of Physical-Chemical and Biological Problems of Soil Science, Pushchino, Russia; I. Khomenko (left), from the Moscow State University, Russia.



National PYRN representatives at the PYRN kick-off meeting in Abisko, Sweden, February 22-24, 2007. From left to right: T. Haltigin (Canada), H. Lantuit (Germany), H. Juliussen (Norway), A. Balsler (U.S.A.), M. Johansson (Sweden), E. Cossart (France), C. Menard (UK), M. Avian (Austria), R. Melo (Portugal), P. Wainstein (Canada) and T. Sueyoshi (Japan). Photograph provided by H. Lantuit



Participants at the OSL-APECS-PYRN training workshop, St.Petersburg, Russia. Photograph provided by H. Kassens.



Students of the UNIS course AG-330 'Permafrost and Periglacial Environments' installing electrodes for resistivity measurements in Endalen, Svalbard, April 25, 2007. See Norway report for more details. Photograph by H.H. Christiansen.



Students participating in the installation of thermistor cables, Alaska. See U.S.A. report for more details. Photograph provided by K. Yoshikawa.



Students and scientists from the UNIS course AG-327 'Holocene and Recent Climate Changes in the High Arctic Svalbard Landscape' at the solifluction monitoring station at Kapp Linne, Svalbard June 30, 2007. Photograph by H.H. Christiansen.



Participants of the field course 'Permafrost and Periglacial Geomorphology of Western Siberia and Western Taimyr'(PPG) on board of the vessel Fedor Naianov. Photograph by I. Streletskaya.



Participants in the project LATITUDE60! at the Pavilhão do Conhecimento in Lisbon, June 29, 2007. See Portugal report for more details. Photograph by M. Mota.



Participants of the field course 'Technogenic and Environmental Permafrost Observatories' (TEPO) at Zapaliarhoe Gas Field. Photograph by D. Husainov.



IPY-ROAM is the "International Polar Year - Research and Educational Opportunities in Antarctica for Minorities" program hosted by the University of Texas at El Paso (UTEP). The picture shows IPY-ROAM participants at Cuverville in the Antarctic Peninsula region.

early April at UNIS, celebrating the start of the IPY. The course had students from Norway, Italy, Netherlands, Germany, Denmark, Finland and Japan. During the course the students were offered lectures by seven different lecturers, all involved in the international IPY project Thermal State of Permafrost (TSP). Students used snow mobile excursions to study different permafrost conditions and periglacial landforms, such as, e.g., the open system pingos in Reindalen. They also did fieldwork to study the ice-content and frost heave in the active layer at a solifluction site in Endalen, and studied how the periglacial landforms such as the debris flows, rockfalls, and snow avalanches form the slopes in the Longyear valley. The students each produced an essay on how a periglacial landform or the permafrost itself is influenced by climate change. This course will be offered again in April 2008.

The IPY EoI no. 24, the International University Course on High Arctic Permafrost Landscape Dynamics in Svalbard and Peary Land, which is part of the TSP IPY project, have submitted an application for Nordic Council financial support for conducting a special IPY permafrost university course, starting in Svalbard and continuing to Zackenberg in northeast Greenland in summer 2008. The result of this application will decide if this course can be held across the north Atlantic during the IPY summer of 2008.

H. Juliussen is the national PYRN coordinator, and within the TSP NORWAY project PYRN activities are included. Angélique Prick was replaced in the IPA Secretariat by Herman Farbrøt October 1.

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POLAND

2007 was remarkable because of the beginning of the IV IPY 2007-2009. On this occasion a special conference organized by the Polish Academy of Science, Ministry of Science and Higher Education and Polish Committee for IV IPY was held in Warsaw in the Staszic Palace, the seat of the Polish Academy of Science, April 27. The programme of the Polish research that will be carried out during the IV IPY was presented. During the II IPY (1932-1933) a Polish team stayed on Bjørnøya (Bear Island) collecting a 13-month long radiometeorological, geomagnetic and meteorological observation series. Polish participation in the III International Polar Year (International Geophysical Year) 1957-1958 was of particular significance. This was a very important period for Poland: the Polish Polar Station situated in the region of Isbjørnhamna in the Hornsund

Fiord on Spitsbergen (Svalbard Archipelago) was created. The Polish research programme accomplished during the III IPY assumed a year-long cycle of meteorological, glaciological, ionospheric, astronomical, permafrost and CO₂ atmospheric observations. Moreover, during the polar summer research was carried out in geology, geomorphology, hydrology, botany, and zoology. The station built in Hornsund 50 years ago is still in use. At present it is a very modern interdisciplinary research centre of the Spitsbergen environment, and its existence enables education of research staff and intensive exploration of the region.

The Polish research programme in the IV IPY undertakes research both in the Arctic and Antarctic and will be carried out on Spitsbergen, based at the station in Hornsund as well at seasonal stations and bases of Polish universities, and on the Western Antarctica – Henryk Arctowski Station on King George Island. In 2007 studies were carried out there of climate, active layer dynamics, periglacial phenomena, functioning of periglacial and glacial geoecosystems under the conditions of growing seasonal changes in climate. This subject is related to or is a part of international IPY projects (TSP and CALM II) coordinated by the IPA.

August 1-5 a conference was held in Longyearbyen (Spitsbergen) entitled *Geodiversity of Polar Landforms* organized on the occasion of IV IPY. The organizers of the conference were: IAG, Association of Polish Geomorphologists, A. Mickiewicz (University of Poznań, Poland), The University Centre in Svalbard (UNIS), Svalbard Science Forum, and the Geological Survey of Norway. On the occasion of the conference there was published the well-illustrated volume *Landform Analysis* in journal of the Association of Polish Geomorphologists, including 34 papers and communiqués as well as the field trip guide on *Formation and remodelling of marginal zones for selected Spitsbergen glaciers*. During the conference participants stayed at the Polish university stations: Kaffiøya (Nicolaus Copernicus University, Toruń), Calypsobyen- Bellsund (Maria Curie-Skłodowska University, Lublin), Petuniabukta (Adam Mickiewicz University, Poznań) and Hornsund (Polish Polar Station of Institute of Geophysics, Polish Academy of Science). During the post-conference excursion on the SBB Horyzont II ship of Gdynia Maritime University, the participants were acquainted with the contemporary glacial, periglacial and littoral morphogenesis of the relief in central and western parts of Spitsbergen.

On October 29-30 a conference was organized by the Institute of Geophysics, Polish Academy of Science, in Warsaw presenting the works from the research project *Structure, Evolution and Dynamics of Lithosphere, Cryosphere and Biosphere in the European Sector in the Arctic*

and *Antarctic* (A. Guterch). The results of the research were published in foreign and domestic publications, mainly in the journal *Polish Polar Research* (vol.25-28, 2004-2007, ISSN 0138-0338), edited by the Committee on Polar Research of Polish Academy of Science.

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RUSSIA

In 2007 Russian geocryologists continued theoretical, experimental, field and stationary research in the framework of national and international projects, including work associated with the International Polar Year.

The Earth Cryosphere Institute (SB RAS) participated in an international expedition that took place on the northern portion of West Siberia in August 2007. It was funded by NASA through the University of Alaska (Fairbanks) and Russian Academy of Sciences (Siberian Branch), as well as through the Earth Cryosphere Institute (Tyumen) within the framework of the project *Application of space-based technologies and models to address land-cover/land-use change problems on the Yamal Peninsula, Russia*. This project is also the intersection of three International Polar Year (IPY) initiatives: (1) Greening of the Arctic (GOA), (2) Cold Land Processes in NEESPI (CLPN) and (3) CircumArctic Rangifer Monitoring and Assessment (CARMA). Sites visited during this expedition form a transect through the natural zones of the Yamal region from the Nadym area (Northern taiga subzone) through the Laborovaya area (southern tundra subzone) to the

Vaskiny Dachi research station (typical tundra subzone). Participants from the USA, Russia, Finland, and Switzerland established seven, 50x50 m grids to measure several biomass properties (NDVI, LAI, species composition and species cover), to sample vegetation and soils, and to probe the active layer. Loggers for monitoring the active layer temperature were installed at a depth of 1.0-1.5 m. Based on long-term monitoring data the staff of the Earth Cryosphere Institute conducted a quantitative evaluation of the response of permafrost formations to modern climate changes.

The Institute of Environmental Geoscience, (IEG RAS), Moscow continued the cooperation with the University of Alaska Fairbanks in the framework of the IPY Project of Permafrost observatories: Thermal State of Permafrost (TSP-125). In 2007, the participants observed the temperatures of permafrost and active layer at eight sites as a part of the Mountain Northern Transbaykalia Permafrost Observatory (Chara Region). Now all these sites are equipped with automated logger thermometric systems. The specialists of IEG RAS worked in close cooperation with Moscow State University staff on the problem of numerical simulation of the ground water flow and heat flux under conditions of non-continuous permafrost. This effort has numerous practical applications in actual engineering works of Russian mining and oil and gas companies.

Modelling the influence of climate changes on the thermal state of frozen ground was continued at the Main Geophysical Observatory (MGO). Ground temperature profiles were considered to a depth of 30 m using a one-dimensional heat-transfer model, taking into account the annual variability of snow cover thickness and phase transitions. A satisfactory fit has been achieved between



Participations of the Geodiversity of Polar Landforms Conference in front of the base of the Polar Expeditions of Maria Curie-Skłodowska, University at Calypsobyen (Bellsund region, Spitsbergen). Photograph by G. Siwek, August 2007.

modelled and observed changes during the 20th century in the thickness of the active layer during seasonal thawing and freezing.

The statistical evaluation of changes in climate elements and in soil temperatures was conducted at the Institute of Global Climate and Ecology, an agency of Hydrometeorology and Environmental Monitoring (RAS). It was noted that, given a noticeable increase in annual average air temperatures practically everywhere on the Russian territory, spatio-temporal changes of frozen ground temperatures have not always been synchronous with air temperature changes. The analysis of the spatio-temporal distribution of soil temperatures at depths of 80, 160, and 320 cm as well as air temperatures and snow cover depth was achieved with the use of GIS MapInfo technologies.

A study of the zonation of the Arctic shelf based on conditions of permafrost formation was carried out at the Geocryology Department (MSU). Continental shelves, which were examined, included glaciated shelves (the Barents Sea and the Kara Sea), periglacial shelves (the Laptev Sea, the East Siberian Sea, and the Chukchi Sea), and “by” glacial shelf (a glacial isostatic shelf of the Beaufort Sea). All these shelves are different in the characteristics of cryolithozone. The two common features for all shelves are: 1) the modern position of the permafrost surface is controlled by thermokarst; 2) thermal abrasion contributed to submarine permafrost transgression and its areal extent. New data regarding the structure and properties of deposits has been collected for thermokarst lagoons of the Bykovsky Peninsula. A cross-section of Quaternary deposits was studied on the south shore of the Bolshoi Lyakhovsky Island and at the Oygossky Yar during the 2007 field season. About 200 km of Dmitri Laptev Strait shoreline was examined. Variability in lateral cross-section structures was observed, and similarities and differences in cross-section structure on opposite shores of the strait were detected. Quaternary formations that had not previously been considered were identified and studied.

It was determined that succession in swamp systems includes relatively stable ecological-geocryological evolution stages (ecological-geocryological climaxes). Such climaxes are characterized by a certain geocryological situation, and are the final stages of ascending swamp area development. The main indicators and characteristics of these climaxes for cryolithozone swamp areas were defined.

The principles of permafrost temperature regime formation, under natural climate dynamics, were established based on the data from Marre-Sale station (Western Yamal) and on modelling. It was shown that the ground temperature reacts similarly to annual changes in air

temperature.

Research at the Permafrost Institute (SB RAS), a special type of icy formations was identified in the structure of the Yakutian ice complex. “Extranivites” (cryolithogenic snow-patch deposits) occupy a separate place among genetic types of continental sedimentary formations. A leading factor in extranivites accumulation is the process of melt water, sheet wash from the lower edge of one or several drifted snow patches. Field work to study the morphology and hydrological characteristics of the Bykovsky Peninsula offshore continental slope was conducted in August 2007. This data supplemented an earlier geophysical exploration in which the drilling profile identified submarine permafrost. The monitoring of geocryological, hydrogeological and geophysical studies in the zone of constructed objects, as Berkakit-Tommot-Yakutsk railroad, the Eastern Siberia-Pacific Ocean oil pipeline, Southern Yakutia hydropower dams and Polar Sea Line’s objects were continued.

In 2007 thanks to IPY the geocryological monitoring survey and educational courses in Russia were enhanced. For the first time the International Educational Permafrost Field Courses in Nadym-Pur-Taz region and in the Tazovsky Peninsula took place. Thirty-four students, graduate students and teachers including 13 Germans and four Americans members participated in these courses. Also the field course along Yenisey River was accomplished (see details in Other News section).

The Geocryology Department (MSU) conducted an experimental study of gas-hydrates formation in fine-dispersed grounds and peculiarities of gas-hydrates containing grounds. Quantitative data on the methane-hydrate and carbon dioxide accumulation kinetics in the pore space of frozen grounds were determined. The method of equilibrium water content evaluation for the gas-hydrates containing grounds was developed. The first experimental data on the thermal conductivity of artificial gas-hydrates saturated grounds was obtained.

The Department of Cryolithology and Glaciology (MSU) investigated the petroleum content and hydrocarbon component structure in polluted seasonally frozen grounds. The model of cryogenic transformation and migration of the mineral and organic materials in the cryolithozone was developed. The amount of greenhouse gases in permafrost and the level of their emission in different landscape and cryofacies conditions were estimated. The possibility and mechanism of ground ice formation as a result of sea and inshore water interaction was shown.

The Institute of Natural Resources, Ecology, and Cryology (SB RAS) studied the role of cryogenic concentration in buffering solutions. New data on the thermodynamics of groundwater layers and the acidic



Participants of the International Conference 'Cryogenic Resources of Polar Regions', Salekhard City, West Siberia. Photograph provided by J. Brown.

kinetics of sulphide ores were obtained. The study of mineralogical and geochemical processes with respect to permafrost stability was continued. The influence of the climate change on the cryogenic processes and permafrost structure in the mountain regions of South-Eastern Siberia was studied.

The Atmosphere Physics Institute (RAS) developed a new model of heat and mass transfer in the soils. This model combined high detailed description of process mechanisms with relatively short time of calculations.

The National Enterprise Fundamentproekt completed the study of karst activity in permafrost regions. Further, the detailed complex survey for objects in the northern part of Western Siberia was completed (Zapolyarnoye, Urengoyevskoye and Bovanenkovskoye gas fields). The geosystem method of zoning by using the matrix analysis of geologic engineering factors was applied to large scale mapping of impact zones on objects in Western Siberia, Yamal Peninsula, Polar Ural and Komi Republic.

The Scientific and Industrial Enterprise on the Engineer Geologic and Environmental Monitoring of Transport Objects continued the deformation survey of motor roads in Transbaykalia. The practical recommendations on the contact-line support stability along the Transbaykalia railroad were issued.

The Department of Cryolithology and Glaciology (MSU) obtained results of experimental tests of ground shearing strength along the surface of freezing with different substances. In so doing the different condition of freezing and structural changes in the ground were taken into account. New data on the influence of petroleum abundance on the long-term compression strength was collected.

The Department of Geocryology (MSU) expanded the original set of electrical and acoustical measurements in the study of the influence of the oil pollution on the

polarization efficiency of the ground. New equipment was tested in the field condition of the Bovanenkovo–Ukhta pipeline. The new method of minimum-rated values measurement of the thawed ground strength was drawn up. It took into account the change of the pore pressure.

New regularities in global and regional climate change were explored at the Department of Cryology (MSU). Cryogenic indicators in a loess-like deposit were detected and analyzed in the central part of the Russian Plain and in North America. Predictive research, jointly with the Moscow Energy Institute staff, was conducted on climate change and the dynamics of permafrost formations in northwestern Russia over the next 300 years. Contemporary evolution of minor glaciation forms in the Caucasus and Siberia (Kuztensk Alatau, Byrranga and Putorana mountains) as well as in Transbaikalia (Kodar ridge) were studied. Meteorological data gathering, measurements of the glacier mass balance and river flow discharge in the Kodar Ridge were established and conducted during the joint research with the Institute of Natural Resources, Ecology and Cryology SB RAS and Institute of Environmental Geoscience (IEG RAS). In addition, basic meteorological and permafrost observations (for temperature and precipitation) were obtained in the surrounding non-glaciated areas (INTAS 06-1000013-8593). The causes for the activation of catastrophic events in mountains were determined. There is a reduction of mountain glaciation and winter snowfall.

The common work of VNIIGAZ-Institute with Department of Geocryology (MSU) and the National Enterprise Fundamentproekt published: *STO Gazprom—Method of geocryological survey for the gas fields prospecting and exploitation.*

In June 2007 the International Conference Cryogenic Resources of Polar Regions took place in Salekhard (Western Siberia). Geologists, geographers, biologists,

medical personnel, civil engineers, soil scientists, climatologists, ecologists, and other specialists participated in this conference. The preliminary results of projects of IPY, educational problems, permafrost variability in continental and offshore regions, arctic hydrosphere and glaciopause, snow cover variability, vegetation change, environmental problems and cryogenic hazards were discussed during the conference. The proceedings of abstracts were published in English and Russian.

In October 2007 the VII International Symposium on Engineering Problems of Permafrost was held in Chita (Transbaikalia). The questions of the transport impact on the permafrost, the kinetics of cryogenic processes and peculiarities of frozen grounds were considered in this forum.

The journal *The Earth Cryosphere* is 10 years old. It appears in print four times a year, informing Russian and international scientific community about the most essential and original results of research in the area of permafrost science and engineering. From the first days of founding the journal, the editor-in-chief was Academician V. Melnikov, Executive Secretary is S. Fotiev and editor of the Moscow editorial board is N. Aroutunian. During these ten years 40 issues of the journal containing 447 articles were printed. A total of 472 authors including 44 foreigners have published in the journal. The academicians and corresponding members of the Russian Academy of Sciences, doctors of sciences, senior specialists of different branches of national economy, students and post-graduates were among them. Editorial staff constantly derived encouragement from representatives of 136 Russian and 36 foreign institutions located in 57 cities in Russia and from 30 foreign cities. The main result of the work of editorial staff, authors and reviewers is the general recognition of the *Earth Cryosphere* as one of the leading components of the Earth cryology. The question of the journal publishing in English is under consideration.

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SPAIN

The First Iberian Conference of the IPA (see Portugal report) included an ANTPAS Iberian representatives meeting with discussions on coordination and priorities for the Iberian groups, and a meeting on the Soil Thermal Monitoring Network on Iberian Peninsula Mountains initiative. Founded by Spanish Science and Technology Programme and led by A. Gómez-Ortíz the network has begun its activities. During the next year the Soil Thermal Monitoring Network of the Spanish and Portuguese IPA

groups plan to obtain systematic soil and atmospheric data of cold mountain environments of the Iberian Peninsula. A working group will coordinate the monitoring sites in Iberian mountains.

Studies of permafrost and periglacial phenomena in 2007 by Spanish research teams were carried out at in the Spanish mountains, Andes, Arctic and Antarctica. These were continuations of programmes started in previous years under the National Research Programmes framework (see *Frozen Ground* 2006, p. 43-44) and the participation in the IPY 2007-2009 of new research projects.

New studies on periglacial environments have been initiated in the Picos de Europa and the Andes. Works in Picos de Europa (Spain) are funded by the Picos de Europa National Park, and coordinated by the research team of the Department of Geography of the Universidad de Valladolid with collaboration of Lugon (University Institute Kart Bösch of Sion, Switzerland). The work is focused on cold environment, the distribution of periglacial processes and the use of periglacial and nival features as geoindicators of environmental changes in the Iberian oceanic high mountains.

The research team from the Department of Physical Geography of Universidad Complutense de Madrid, headed by D. Palacios and with seven other researchers including Visiting Prof. Zamorano from Universidad Nacional Autónoma de México, conducted an intensive fieldwork campaign from July to September 2007, on the great stratovolcanoes Coropuna, Amapato, Chechani and Misti in the western Andes of southern Peru. The objective is analysing the distribution of permafrost in this hyperarid sector of the Andes, by studying rock glaciers as the main geomorphologic manifestation of this process, and relating permafrost distribution evolution to the overall recession of the glaciers. The interrelationship between permafrost dynamic and volcanic activity is another major objective. Results from these studies will be used to determine the extent of solid water resources and the prevention of catastrophic hydrovolcanic processes. The Universidad Complutense team also conducts ongoing monitoring of permafrost in Mexico on the volcanoes Popocatepetl and Iztacihualt. Since very little scientific work has been done on permafrost dynamics on active volcanoes or on permafrost in tropical mountainous areas, the team invites researchers interested in these topics to exchange information and methodologies at the next IPA conference. Interested parties should contact D. Palacios (davidp@ghis.ucm.es).

The Spanish participation in the IPY 2007-2009 consists of nineteen coordinated projects funded by the Spanish Polar Research Program. Seven projects are developed in the Antarctica, four in the Arctic and

Antarctica, six in the Arctic and one in the subantarctic environments (Andes). Six Spanish projects on cold environments, periglacial processes, permafrost and climatic change are presently involved in works coordinated with seven IPY research programmes: ANTPAS (Antarctic and sub-Antarctic Permafrost), TSP (Thermal State of Permafrost), GLACIODYN (The Dynamic Response of Arctic Glaciers to Global Warming), PLATES-GATES (Plate Tectonics and Polar Gateways in Earth History), MERGE (Microbiological and Ecological Responses to Global Environmental Changes in Polar Regions), TARANTELA (Terrestrial Ecosystems in Arctic and Antarctic: Effects of UV light, liquefying ice and ascending temperatures) and EBA (Evolution and Biodiversity in the Antarctic: the Response of Life to Change).

The Departments of Botany II and Regional Geographic Analysis and Physical Geography of Universidad Complutense de Madrid are currently engaged in an IPY research project titled *Glacier Retreat, Colonization Processes and Gene Flow in Primary Lichen Communities from Arctic and Antarctic Areas* (Polar-Pioneer). The first phase of fieldwork took place in June-July 2007 on Svalbard, and produced interesting results regarding lichen colonization in areas affected by permafrost which had been deglaciated in the last 30 years. Other findings were associated with processes occurring in the active layer that influence factors affecting lichen colonization. In January 2008, another programme of fieldwork will be launched on Navarino Island (Tierra de Fuego, Chile) and in the Antarctic. This project is coordinated with the IPY project MERGE.

A. Pérez-Alberti (Universidad de Santiago de Compostela) coordinates a research team of 10 Spanish and Argentinean geomorphologists, pedologists and climatologists working on *Mapping, monitoring and thermal control of crionival landforms in Subantarctic Region: Southern Andes and Los Estados Island* (Tierra de Fuego, Argentina) (GEOSAP). The project is coordinated with the ANTPAS IPY project. The main objective is to analyse the thermal behaviour of active layer and periglacial processes in the Andean high mountains. During the next three years the group will work in the field to study the evolution and the present-day environmental changes and pedogenetic processes in cold high mountain environments related to permafrost.

The project on *Geomorphic dynamic, periglacial environment and present-day tectonics in the Northern Region of Antarctic Peninsula area: Hydrological and environmental implications* is coordinated by J. López-Martínez (Universidad Autónoma de Madrid). Eleven researchers work in the South Shetland Islands, and the Northern Antarctic Peninsula. During the last austral summer the group worked in Seymour Island on permafrost mapping, hydrological processes and tectonic features. The project

is engaged in the IPY research Projects ANTPAS and PLATES-GATES. The objective is to analyse the connections between hydrology, soils, geomorphic processes and permafrost. The group is working together with the ANTPAS Working Group in the Antarctic Permafrost Map, coordinated by J. Bockheim and M. Balks.

Another international team led by the University of Alcalá de Henares, with the participation of nine researchers from Spanish Research Centres, Universidade de Lisboa and University of Zurich, is monitoring active layer and permafrost thermodynamic in South Shetland Islands (Antarctica). The project, *Permafrost and Active Layer Monitoring and Modelling in Livingston and Deception Islands (Antarctic)*, is coordinated by M. Ramos, and is carried out in the Antarctic during the IPY. The CALM-S site installed in both islands will be completed, with plans to include two 20-25 m deep borehole drillings in Deception and Livingston Island. The project is coordinated with the IPY projects ANTPAS and TSP.

The Department of Ecology of the Universidad Autónoma de Madrid with seven research centres are working on 'Limnopol project', currently coordinated with the IPY research projects TARANTELA, EBA and MERGE. The team is coordinated by A. Quesada, and works on the Byers Peninsula on limnology and temperatures and precipitations variations, the increase of UV radiation, biodiversity and the interaction between organisms, and the environmental impact of scientific and tourist activities in a permafrost environment.

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SWEDEN

The GeoBiosphere Science Centre of the Lund University continued and expanded its activities in the Abisko area. The 'Nordic Centre for Studies of Ecosystem Carbon Exchange and its Interaction with the Climate System' (NECC) has two monitoring sites in the Stordalen area. The CARBOMONT project *Effects of land-use changes on sources, sinks and fluxes of carbon in European mountain areas* and the ELSA project *Exchange processes between the Land Surface and the Atmosphere* have intensive and important field activities in the Abisko area, especially in and around the Stordalen bog. For these projects the status and dynamics of the active layer and the permafrost in the bogs are of great importance.

The old "IPA Abisko area active layer transect" is maintained in co-operation with the Abisko Research Station. J. Akerman and M. Johansson are maintaining 10 of the original 12 CALM sites along the 100 km east-west transect. Two sites have been abandoned as all permafrost has disappeared. The active layer sites have been



Experiment that simulates effects of future increases in snow. Photograph by M. Johansson, March 2007.

monitored since 1978, and annual basic data is presented within the CALM reporting system. A full status report will be given at the NICOP conference in Fairbanks. The trend of a deepening active layer is continuing at all sites, and at one of the mountain sites (at 900 m asl) substantial thawing is observed, and the large pingo-like features have collapsed. At 975 m asl the pingos shows substantial subsidence. A new low level air photo survey of the sites was performed in September 2007.

M. Johansson is continuing her PhD project *Permafrost dynamics and its implications for biodiversity and ecosystem functioning* (supervisors: T. R. Christensen, J. Akerman). The snowfences, simulating predicted future increases in snow depth at a peat mire in the Abisko area, were now used for two years. In addition to the increases in active layer depth that was detected after the first year, as was the case in the second year, also differences in the vegetation in late autumn were detected. When all the surrounding vegetation had turned into its yellowish autumn colours, the vegetation in the plots with snow fences was still green. The snow fences are reinstalled for another season. Ground temperatures at three of the CALM sites were analyzed and a paper submitted to NICOP. A new vegetation removal experiment was initiated at the Storflaket mire, where different vegetation types (dwarf shrubs, gramanoids and mosses) were removed and the influence of different vegetation types on active layer and ground temperatures are now being investigated. This project is jointly financed by the Abisko Research Station and Lund University. Installations of snow cover manipulation plots, snow cover depth, soil temperature measurements, a daily camera survey and a complete microclimatic station are operating next to one of the old CALM grids.

R. Nyberg (Dep. of Earth Sciences, University of Karlstad) is maintaining several small projects in the Abisko area concerning the dynamics of the Kårsa glacier, permafrost and slope processes in the Pallenvagge and Nissunvagge valleys, and the assessment of the importance

of extreme erosional events as geomorphological hazards and as climatic indicators in the Abisko area.

The Department of Physical Geography and Quaternary Geology of Stockholm University is conducting permafrost research in northern Sweden, the Central Canadian Arctic and Northeast European Russia, funded by grants from the Swedish Research Council and the European Union (to P. Kuhry) and private foundations (to B. Sannel and G. Hugelius). Sannel started her PhD studies in August 2004 (supervisor P. Kuhry) on the topic of *temporal and spatial dynamics of peat plateau/thermokarst lake complexes*, which includes plant macrofossil studies, remote sensing and ground monitoring of peat plateau areas in Scandinavia, Canada and Russia. A first publication is now in press. Sannel has maintained a new permafrost monitoring site in a remote peat plateau/thermokarst lake complex in the Tavvavuoma Region, northernmost Sweden since 2005. Now the setup consists of a meteorological station, a camera, nine boreholes and nine snow stakes. Hugelius started his PhD studies in November 2006 (supervisor P. Kuhry) on the topic of *Landscape patterns of soil organic matter quantity and quality in permafrost terrain*. At present, field data collected in summer 2006 from the Tulemalu Lake Area (Central Nunavut), located in continuous permafrost terrain, are being analyzed by Hugelius in cooperation with C. Tarnocai, Ottawa. In summer 2007, a considerable number of new pedons were collected in discontinuous permafrost terrain near Vorkuta, Northeast European Russia in cooperation with G. Mazhitova. R. Garcia (supervisor P. Crill) from the Department of Geology and Geochemistry, Stockholm University will conduct detailed geochemical studies on the lability of soil organic matter in permafrost terrain. The latter activities are conducted in the framework of the EU-funded CARBO-North project (coordinated by P. Kuhry). This European project (<www.carbonorth.net>), with additional partners from Russia and USA, aims at quantifying carbon pools and fluxes in northern Russia in the past, present and future under conditions of climate warming and permafrost thawing. New results will be presented at NICOP. These studies represent a significant contribution to the IPA and IPY CAPP project on *Carbon Pools in Permafrost Regions* (co-chaired by P. Kuhry).

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SWITZERLAND

PERMOS (Permafrost Monitoring Switzerland) <www.permos.ch> has a coordination office. Since January 2007, J. Noetzli and I. Roer support D. Vonder Mühll with the PERMOS implementation. Thanks to

support from the Swiss Academy of Sciences (SAS), the Federal Office for Environment (FOE) and the Federal Office for Meteorology (MeteoSwitzerland), PERMOS has a half time position for the period for 2007-2010. Meanwhile all PERMOS elements were evaluated. Those elements that will be continued for the next decades will be updated according to a methodological/technological standard. Each element is maintained by one of the Swiss university institute partners. At the same time, the monitoring concept was adapted.

The Swiss Society on Snow, Ice and Permafrost (SIP) (<snow-ice-permafrost.ch>) had several excursions and meetings. In February a public open meeting was organized together with the Swiss Alpine Club and Swiss Alpine museum in Bern. In July a workshop and an excursion was organized together with the Swiss Geomorphological Society in the Upper Engadin, celebrating the 20th anniversary of the Murtèl borehole. SIP is open to everyone interested in cryospheric research in Switzerland. President M. Hoelzle (hoelzle@geo.uzh.ch) is happy to receive applications for membership.

An international group set up a project in the context of a possible acceleration of rock glacier creep due to changing climate. The main goal is the quantification and monitoring of subsurface properties, especially the ice content and water content as relevant parameters. The Gianda Grisca rock glacier, a highly active rock glacier at Piz Julier, Eastern Swiss Alps, is investigated by studying the interplay between kinematic, thermal and textural properties of the creeping permafrost body (R. Frauenfelder, SNF-scholarship, Univ. of Oslo, C. Hauck, Univ. of Karlsruhe, C. Hilbich, Univ. of Jena, and C. Kneisel, Univ. of Würzburg). The aim of the project is a mid-term monitoring of the ice content, active layer thickness, creep velocity and MAGST.

Reports from the Institutes

Swiss Federal Institute for Snow and Avalanche Research is developing practical recommendations for the construction of infrastructure on mountain permafrost. In the Alps there are only guidelines for the construction of snow-supporting structures in permafrost, and none for other types of infrastructure such as cableways, mountain huts and pipelines. A combination of information derived from case studies, in-situ measurements, laboratory experiments and numerical modelling is applied in the development of the recommendations, which will cover each construction phase, from permafrost detection to infrastructure maintenance and long-term monitoring. They aim to provide technical solutions to reduce the damage potential as well as the costs and risks involved in the construction and maintenance of high mountain

infrastructures in permafrost terrain affected by climate warming. The project is financed by the Swiss Federal Office of Transport and Canton Valais, and is carried out in collaboration with Geotest and with the Swiss Alpine Club (C. Bommer and M. Phillips).

Universities of Fribourg and Lausanne

The Institutes of Geography of the University of Fribourg (R. Delaloye, S. Morard, E. Perruchoud) and Lausanne (C. Lambiel, K. Pieracci, C. Scapozza) focus their investigations on different sediment deposits (rock glaciers, talus slopes, moraines) located in the periglacial belt and in the belt forest of the Swiss Alps. The surface velocities of about ten rock glaciers have been measured with DGPS since 2000 (for the oldest series). Noteworthy are two surging rock glaciers (Tsaté-Moiry and Petit Vélán), for which the measured velocities are about 5 m a⁻¹. Further studies focus on determining the permafrost extension and structure using 1D and 2D geoelectrical and ground surface thermal measurements. A number of permafrost boreholes were drilled in autumn 2007. In October 2006, an excavation (for a ski run) removed the active layer up to the top of the permafrost at Col des Gentianes (2900 m asl), where a 20 m PERMOS borehole is located. The thermal regime at a low elevation talus slope at Dreveneuse (Swiss Prealps) was investigated. Two boreholes proved the presence of extrazonal permafrost about 1000 m asl below the regional lower limit of the discontinuous permafrost. Investigation about the influence of air circulation through talus slopes and relict/inactive rock glaciers is continuing on several sites.

University of Zurich

Numerical experiments with both idealized and real topographies were conducted to investigate the influence of time and depth scales of past and future transient effects that influence permafrost temperatures below alpine topography. The remaining palaeo-effects from the last ice age and earlier are very small for subsurface permafrost temperatures, whereas transient effects of current and future warming were found to be highly relevant for the subsurface thermal field (J. Noetzi, S. Gruber).

For the permafrost research site on the Schilthorn ridge a 4D investigation of the subsurface permafrost conditions has been started that uses a combination of numerical temperature modelling and field measurements of ground temperatures and electrical resistivity tomography (J. Noetzi, C. Hilbich, M. Hoelzle, Ch. Hauck, M. Krauer, S. Gruber).

The preparatory study to designate the location of a new permafrost borehole on the Zugspitze, Bavarian Alps, involved a 3D permafrost modelling effort. The 3D thermal field for the Zugspitze crest was calculated based



Installation of a PERMASENSE wireless sensor network in an ice face on the northern side of Sphinx/Jungfrauojoch (3500 m asl). Photograph by S. Gruber.

on energy-balance and heat conduction models designed for use in complex topography. The drilling was planned for summer 2007 (J. Noetzli, S. Gruber, A. v. Poschinger (Bavarian Environment Agency), W. Haeberli).

Studies on the interplay between slope stability and frozen rock are being continued (L. Fischer, J. Noetzli, S. Gruber, Ch. Huggel).

Nearly one kilogram of ice was recovered in 2005 from the detachment scar of a rockfall on Matterhorn by Italian researchers and mountain guides (U. Morra, L. Trucco). This ice is now being analyzed (D. Wagenbach (IUP, Heidelberg, Germany), R. Kaegi, S. Gruber).

Ongoing monitoring of rock glacier kinematics is conducted in the Valais (I. Roer, University of Zürich). In addition, I. Roer started to compile an inventory of collapsing active rock glaciers in the Alps with contributions by R. Delaloye (University of Fribourg) and M. Avian (Graz University of Technology).

A profound analysis of rock glacier stratigraphy and ice content was enabled by ski-run construction works near Zermatt, where a complete rock glacier was excavated. Here, geomorphological mapping was combined with geophysical surveys and the extraction of ice-samples (I.

Roer, C. Hauck (University of Karlsruhe), C. Hilbich (University of Jena)).

The EU-funded project SuPerForm (Subarctic Periglacial Landforms) dealing with solifluction and gelifluction processes in Swedish Lapland is continued by I. Roer, in collaboration with C. Kneisel (University of Würzburg).

The development and deployment of wireless sensor networks and corresponding hard-/software dedicated to low-power autonomous operation under high-mountain conditions continued within the PERMASENSE project that is part of the National Center of Competence in Research (NCCR) on Mobile Information and Communication Systems (MICS) and co-funded by the Federal Office for the Environment (FOEN). The project comprises researchers of the Universities of Zurich and Basel, as well as ETH Zurich (A. Hasler, I. Talzi, S. Gruber, J. Beutel, H.U. Gubler, D. Vonder Mühll, Ch. Tschudin, and L. Thiele).

Ongoing several small projects on energy exchange at the surface and within the active layer are investigated at the Murtél-Corvatsch and Schilthorn sites, Switzerland. Energy fluxes at the surface (including snow) and within the active layer are still poorly understood, but play an essential role in process-oriented research and sensitivity studies with respect to complex interactions and feedback mechanisms within the alpine permafrost system. Circulation of water, and especially air, can cause important lateral fluxes of mass and energy within coarse blocks on steep slopes and result in highly variable and some times extreme thermal offsets between the ground surface and the permafrost table. Measuring and modelling such fluxes together with coupling time-dependent surface and subsurface ground thermal conditions in characteristic alpine materials (bedrock, ice-rich debris, blocky debris and fine-grained deposits) constitute the main challenges (M. Hoelzle, S. Gruber, J. Noetzli, M. Hauck, C. Hilbich).

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UNITED KINGDOM

C. Harris and M. Kern-Luetschg (Cardiff University), J. Murton (University of Sussex), M. Davies (University of Auckland) and F. Smith (University of Dundee) have continued their programme of experimental modelling of solifluction processes at UMR CNRS 6143 M2C Caen, France, in collaboration with M. Ertlen-Font. This project, funded by the UK's NERC and the France's CNRS, has successfully simulated solifluction processes in two identical slope models, one subjected to one-sided



UK-France research team prior to excavation of instrumented slope models in a cold room facility, Caen, France, September 2007. From left to right: M. Davies, J. Murton, C. Harris (behind), F. Smith (front), M. Font (behind), M. Kern-Luetsch (front) and A. Dubois. Photograph provided by C. Harris.

freezing and thawing with a basal water supply, and the second in which a refrigerated base plate maintained a basal permafrost zone and active-layer freezing was two sided. Over the three-year project, models have been subjected to 17 freeze-thaw cycles in total, with hourly monitoring of soil temperatures, pore water pressures, frost heave, thaw settlement and down-slope soil movements. Excavation of buried displacement columns has revealed clear contrasts in the style of solifluction resulting from one-sided seasonal freezing and thawing in the absence of permafrost, and two-sided active-layer freezing associated with permafrost.

In parallel to this full-scale modelling, the Cardiff group have undertaken scaled centrifuge modelling of solifluction under one-sided (seasonally frozen ground) and two-sided (permafrost) freezing regimes, using the same slope geometry and test soil as in the full-scale model. Research is funded by the UK EPSRC, and the centrifuge technique has proved highly effective, with results entirely consistent with the full-scale modelling outcomes. The project has also included detailed field measurements in Dovrefjell, Norway (seasonally frozen) and Endalen, Svalbard (permafrost) so that centrifuge and full-scale modelling will be validated against field data. Finally, new numerical approaches based on advanced Thermal-Hydraulic-Mechanical modelling are under development at Cardiff University by H. Thomas, P. Cleall and Y. Li. Numerical models will be calibrated using data from the physical modelling programme.

At Sussex University, setting up the cold room for permafrost experiments continues, as monitoring equipment and hardware were installed. Blocks of chalk from a variety of lithostratigraphic units have been obtained from southern England, and are ready to be

instrumented for tests on ice segregation and rock fracture beneath horizontal and steeply inclined surfaces.

The influence on Pleistocene permafrost and periglacial processes on the English landscape continues to be examined. S. Gurney (University of Reading) is investigating a site in Herefordshire, which preliminary work has revealed may contain several relict cryogenic mounds. Electrical resistivity techniques are being employed to map sediment structures in the sub-surface, which may provide further evidence for the origin of the features. At Pegwell Bay, in Kent, J. Murton, C. Whiteman (Brighton University), M. Bateman (Sheffield University) and C. Baker (St Lawrence College) are studying stratigraphic sequences extending back from Marine Isotope Stage 2 to 4 and probably earlier. A field trip celebrating the 50th anniversary of the seminal paper on the periglacialiation of southern England by T. Punga was led by P. Worsley (Oxford University), visiting sites between Kent and Devon. The role of permafrost on landscape evolution in southern England is currently being re-evaluated by J. Murton, integrating studies of Tertiary erosion surfaces, Cenozoic drainage evolution, crustal uplift, and experimental work on bedrock fracture and solifluction.

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UNITED STATES OF AMERICA

Planning activities for the Ninth International Conference on Permafrost (NICOP) included the review of 625 abstracts and over 400 manuscripts. A meeting of an international review team met at the U.S. Geological Survey, Menlo Park, California, in December 2007. In addition to paper and poster sessions, a series of 20 plenary presentations will cover topics on Alaskan permafrost, global thermal state of permafrost, engineering challenges, hydrologic and terrestrial processes, and polar and alpine periglacial processes. See www.nicop.org for late-breaking conference news and field trip registration. The U.S. Permafrost Association (<www.uspermafrost.org>), with over 200 individual and corporate members, is providing the administrative support for NICOP. The USPA Board and members meet annually at the AGU in San Francisco to elect new officers and conduct the Association's other business.

The 2007 Fall Meeting of the American Geophysical Union was held in San Francisco, California, December 10–14, 2007. There were 392 abstracts presented in 29 Cryosphere sessions, as well as 14 IPY presentations in two Union sessions and a number of permafrost and carbon abstracts in Biogeosciences. Reports and posters covered cold region hydrology, surface and subsurface

processes including permafrost, seasonally frozen ground, interactions between snow cover and soil, as well as periglacial processes. The IPY sessions covered progress in high latitude research. The focus on seasonal frozen ground and permafrost at AGU continues to expand as indicated by the interdisciplinary nature of presentations at the 2007 AGU Fall Meeting.

The 2007 Annual Meeting of the Association of American Geographers was held April 17–21 in San Francisco. The AAG's Cryosphere Specialty Group (CrSG) sponsored 18 paper sessions on topics including periglacial processes, glaciology, snow science, the effects of climate change on cryospheric environments, and human adaptation in polar regions. The CrSG made two awards for 2007: the *F. E. Matthes Award* was presented to R. G. Barry (University of Colorado, NSIDC) in recognition of a half-century of contributions to cryospheric science. D. Streletskiy (University of Delaware) received the *R. S. Tarr Award* for best student paper, titled *Monitoring frost heave and thaw subsidence in northern Alaska with differential GPS* with coauthors J. Little, N. Shiklomanov, and F. Nelson.

A symposium entitled 'Permafrost on a Warming Planet' was organized by J. Brown at the 58th AAAS Arctic Science Conference held in Anchorage, Alaska, September 24–26, 2007. Seven reports were presented on topics of state and fate of permafrost, thermokarst in Alaska, methane emission from lakes, retrogressive thaw slumps, patterned ground distribution, subsea permafrost, and carbon storage in soils.

T. Krzewinski, chair of the Technical Council on Cold Regions Engineering (TCCRE) of the American Society of Civil Engineers (ASCE) reported the following:

- Members attended the ISCORD 2007 conference (September 25–27 in Tampere, Finland), sponsored by the Finnish Association of Civil Engineers (RIL) and by ASCE–TCCRE. 150 participants attended, with 118 papers published in the proceedings. Meetings of the TCCRE committees were held in Tampere and in San Francisco in December 2007 in association with the NICOP and USPA meetings. TCCRE is a cosponsor of NICOP and is assisting in technical reviews and in developing several permafrost engineering sessions.

- TCCRE contributed to updating the ASCE Standard on Frost Protected Shallow Foundations, FPSF (2008 release). T. Krzewinski and E. Clarke provided recent revisions. TCCRE is representing ASCE in a new PBS Documentary 'Challenges of Transportation Infrastructure Design and Construction in Alaska'. T. Krzewinski is leading the effort for ASCE with help from B. Connor of UAF, K. Korri of Alaska Department of Transportation, and T. Brooks of the Alaska Railroad.

- The ASCE's 14th International Specialty Conference

on Cold Regions Engineering will be held in Duluth, Minnesota, September 2009.

- Recent, current, and future ASCE publications include: Quarterly Journal on Cold Regions Engineering; Proceedings of the 13th Conference available on CD; and TCCRE monograph 'New and Unconventional Foundations/State of the Practice–Permafrost Foundations', with authors including E. Clarke, D. Miller, M. Musial, J. Zarling, and B. Borjesson. TCCRE monographs in process: Field Properties and Site Investigations - Frozen Ground; Hydraulics and Hydrology; River Ice In Cold Regions; Water Treatment in Cold Regions; Cold Regions Ports and Harbors.

- Current TCCRE Committee members are: Chairman T. Krzewinski, Vice Chair J. Woodworth, Secretary J. Ullring, Past Chair J. Bergman, Member J. Allen, ASCE Staff Contact J. Segna, Journal Editor J. Zufelt. Incoming Chair of the Technical Activities Committee and representing TCCRE is D. Prusak.

On October 3, 2007, the University of Colorado's National Snow and Ice Data Center hosted former U.S. Vice President Al Gore for a private science briefing at the request of Mr. Gore (see photo). After brief presentations by NSIDC scientists concerning the latest research on Arctic sea ice, snow, glaciers, permafrost, and ice sheets, an extensive discussion ensued. Mr. Gore expressed particular interest in climate interactions and changes occurring in our planet's cold regions, including changes in permafrost.

At the University of Colorado's National Snow and Ice Data Center (NSIDC) O.W. Frauenfeld, together with T. Zhang and M.C. Serreze, are investigating the interactions between synoptic-scale atmospheric circulation variability and the soil thermal regime (soil temperatures, active layer thickness, and seasonal freeze depths) in the Russian Arctic. This NSF funded project provides a synthesis of observational surface-atmosphere interactions in the high latitudes of Eurasia over the last ~70 years. Feedbacks from the soil thermal regime to the overlying atmosphere are also investigated, using both statistical and modeling approaches.

R. Sletten, University of Washington, reports that a special seminar on periglacial processes is planned in honor of Link and Tahoe Washburn at the Quaternary Research Center, February 2008. The NSF-funded Greenland biocomplexity project is completed; however, data logging instrumentation for active layer thermal characteristics, soil creep monitoring, and microclimate is being maintained. A new NSF project focuses on ground ice in Antarctica (R. Sletten, B. Hagedorn, B. Hallet). Two new meteorological stations will be established and permafrost cores will be collected along a transect from sea level to over 2500 m asl. A collaborative



Former U.S. Vice President Al Gore and researchers of the National Snow and Ice Data Center; R. Barry on the right and T. Zhang on the left of the Vice President. Photograph provided by T. Zhang and O. Frauenfeld.

project with M. Prentice, Indiana University, continues in Taylor Valley, using soils and geomorphology to study the history of the West Antarctic Ice Sheet excursion into the valley. A NASA project on remote sensing to study snow cover using microwave, visible spectra, and thermal properties complements the Dry Valley ground ice study (D. Winebrenner, R. Sletten, B. Hallet, J. Putkonen, B. Hagedorn). For further information and research updates visit depts.washington.edu/icylands.

F. Nelson and N. Shiklomanov (University of Delaware Permafrost Group, UDPG) report that the CALM sites in northern Alaska were visited by A. Klene, University of Montana, C. Seybold, U.S. Natural Resources Conservation Service (NRCS), and UD grad students D. Streletskiy, Melanie Schimek, and R. Ippolito. N. Shiklomanov and A. Klene, with students Streletskiy and Wallace (UM), participated in an international permafrost field course in Russia (see Other News). We continued our work with J. Doolittle (NRCS) on applications of three-dimensional ground-penetrating radar (GPR) images of the active layer and shallow permafrost (see *Permafrost and Periglacial Processes* 18(4)). Doolittle has been working closely with UD graduate student Mark Demitroff on applications of 3D GPR imaging for resolving networks of fossil cryogenic sediment-filled wedges in southern New Jersey. With T. Zhang (NSIDC) and S. Gruber (University of Zurich), F. Nelson was guest editor of a collection of permafrost papers in *Journal of Geophysical Research—Earth Surface* (2007, 112(F2)). The second International CALM Workshop is being planned, to be held in Barrow in late June 2008. H. French and

F. Nelson have completed editing a “lost” book manuscript from the early 1960s written by legendary permafrost scientist Siemon W. Muller (Stanford University). The volume, of great historical interest, is planned to be available at NICOP.

W. Eisner, K. Hinkel, C. Cuomo, and colleagues (K. Peterson, E. Maurer, R. Beck, J. Bockheim, and B. Jones) are continuing a multidisciplinary study of landscape processes on the Arctic Coastal Plain, focusing on the thousands of thaw lakes of northern Alaska. A recent article in *JGR-Earth Surface* described the comparison of Landsat-1 (MSS) imagery from the mid-1970s to Landsat-7 ETM+ imagery from around 2000; 50 lakes completely or partially drained over the 25-year period which indicates landscape stability. The lake-specific drainage mechanism can be inferred in some cases, but efforts to understand landscape processes and identify drainage events have been enhanced by interviewing Iñupiaq elders and others practicing traditional subsistence lifestyles.

V. Romanovsky and the University of Alaska Fairbanks permafrost group at the Geophysical Institute/International Arctic Research Center (K. Yoshikawa, S. Marchenko, D. Nicolosky, R. Daanen, G. Grosse, and A. Kholodov) continue to work on permafrost and active layer dynamics in Alaska, the instrumentation of boreholes and acquisition of subsurface temperatures from circum-arctic permafrost regions (IPY TSP project), and modeling permafrost in Alaska, Siberia, and Greenland. Under the NSF-sponsored Russia-United States TSP project, coordinated by A. Kholodov,

a network of boreholes was instrumented for long-term temperature observation in the Russian Arctic (48 boreholes in 2006, 50 more in 2007). Observations in the 60+ existing Alaskan permafrost observatories continued. S. Marchenko continued research in the Northern Tien Shan Mountains, Kazakhstan, and with Ghent University (Belgium) and Gorno-Altai State University (Russia) in the Altai Mountains, Russia. G. Grosse's fieldwork in the Kobuk Valley National Park (with NPS Alaska), Yakutsk (with K. Yoshikawa), and in Cherskii (with S. Zimov, Northeast Science Station Cherskii) focuses on thermokarst lake dynamics and landscape processes employing GIS and multi-temporal remote sensing. Grosse is maintaining and developing the Permafrost Young Researchers Network Thesis Bibliography. R. Daanen is collaborating with Danish permafrost researchers at the Technical University of Denmark, Greenlandic permafrost researchers (ASIAQ), and the Danish Meteorological Institute on modeling the Greenland permafrost history using high resolution climate simulations. Field and laboratory studies in Alaska were performed to understand the effects of differential insulation on soil freezing processes and especially on soil movement due to differential ice accumulation.

K. Yoshikawa and T. Saito, University of Alaska Fairbanks, have visited 35 native village schools to install shallow (to 6 m depth) permafrost cables and active layer frost tubes. The stations are adjacent to schools in Alaska and several other countries. Monitoring permafrost temperature and seasonal thaw provides students the opportunity to collect, analyze, and share data. In spring 2007, they visited 12 villages along the Yukon River by snow machines, bringing a light-weight rotary percussion drill. All data are shared online: <www.uaf.edu/permafrost>. This outreach project is supported by the University of Alaska's EPSCoR, NASA, and NSF IPY (TSP) programs.

In support of the TSP project, G. Clow and F. Urban (U.S. Geological Survey) re-measured temperatures in nearly all the deep boreholes in northwestern Alaska. The remaining wells, located in the foothills of the Brooks Range, will be relogged during 2008. The DOI/GTN-P active-layer network was serviced, and a number of improvements were made to the radio telemetry system in the eastern portion of the U.S. National Petroleum Reserve (NPR-A) and in the Arctic National Wildlife Refuge (ANWR). High-resolution dynamical down-scaling experiments were initiated using the Weather Research & Forecasting Model (WRF) for federal lands in northern Alaska.

K. Bjella (CRREL Hanover) reports that modifications to the cooling system in the Permafrost Tunnel in Fox, Alaska, are underway. Outdoor air was brought in

starting in early February. The forced circulation lowered permafrost temperatures to -4.5 to -3.5°C , depending on the season, which subsequently slowed the creep rate by a factor of three. This will help insure the continued use of the facility for research and outreach into the foreseeable future.

T. Douglas (CRREL Fairbanks) reports that at the Farmer's Loop permafrost research site near Fairbanks, Alaska, a 3-m borehole was drilled in the late spring of 2007 and 10 thermistors, provided by V. Romanovsky, were installed. A meteorological tower (provided by C. Collins) and a series of snow depth and temperature probes (provided by M. Sturm) were also installed at the site as part of the CALM network. In August 2007 a group lead by K. Yoshikawa and Y. Shur measured electrical resistivity along three lines in the two previously disturbed plots adjacent to the CALM site which was probed again in October.

J. Bockheim, University of Wisconsin, continues to work with the New Zealand Antarctic Programme and will spend the austral summer in the Darwin Glacier region.

By using high-resolved simulated soil temperature data (10500 values) N. Mölders and D. P. Mazumder (University of Alaska, Fairbanks) theoretically examined how network density and design affect regional averages of soil temperatures. Permafrost networks that have sites non-randomly distributed may overestimate regional soil temperatures compared to the regional soil temperature determined from all data. Network density also plays a role. Networks with 400 or more sites will capture the regional average and trends well, if they are randomly distributed over the entire region.

Z. Yang, H. Liu, and U. Dutta from the School of Engineering, University of Alaska Anchorage, continued research of seasonally frozen ground effects on the engineering structures in cold regions. With the support of two grants from the Advanced National Seismic System of U.S. Geological Survey, they recently completed instrumentation of a bridge and a high-rise RC-type building in Anchorage, Alaska. State-of-the-art seismic sensors and data acquisition systems were installed in the spring 2007 for collecting building performance data during seismic events. Together with K. Hazirbaba of UAF, they have successfully obtained support from the Alaska University Transportation Center and Alaska DOT & PF to study the effects of permafrost and seasonally frozen ground on the seismic input to infrastructures.

N. and B. Shumaker, BeadedStream, announced a new ultra-rugged portable (handheld) data collector for its temperature acquisition cables (TACs). The TACs are being used throughout Alaska for tundra access studies, refrigerated foundation systems, monitoring permafrost

temperatures, and for geotechnical engineering projects, among other applications. The all-digital TACs provide options for Internet access.

Finally, we congratulate J. C. F. Tedrow, Rutgers University, on the celebration of his 90th birthday (April 21, 2007), and we recognize his many past and continuing contributions to polar soil science.

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ASSOCIATE MEMBER: PORTUGAL

The research group on Antarctic permafrost at the Centre for Geographical Studies, University of Lisbon, (CEG-UL) continued in 2007 the activities in the South Shetlands (Antarctic Peninsula region) under the coordination of G. Vieira. The collaboration within the project PERMAMODEL with the University of Alcalá de Henares (Spain) included fieldwork in Livingston and Deception islands with the maintenance and installation of CALM-S sites: Crater Lake in Deception Island and Reina Sofia Hill and Ramos Col in Livingston Island. Studies on coastal rock platform erosion by brash have started in both islands, with the installation of a series of transverse micro-erosion meter monitoring sites by M. Neves, who participated in this campaign. A. Trindade participated in the Bulgarian Antarctic Campaign in Livingston Island, and installed a CALM-S site in the vicinity of the Bulgarian station.

In the Antarctic season of 2007-08 the CEG-UL group is co-coordinating the project PERMADRILL/PERMAMODEL, a collaboration with the Spanish and Bulgarian Programmes, including researchers from the universities of Lisbon, Évora, Alcalá de Henares, Zurich and Sofia. The objective is to drill two 25 m boreholes in permafrost in Livingston and Deception Islands to start long-term monitoring sites. This project is funded by the Spanish Polar Programme and by the Calouste Gulbenkian Foundation.

The collaboration with the Bulgarian Antarctic Institute is continuing in the season of 2007/08 with the project ShallowDrill. This is a partnership between the CEG-UL group and Hilti, which is providing drilling equipment for 5-7 m boreholes. In this framework a series of shallow boreholes will be drilled in bedrock in the vicinity of the Bulgarian Antarctic Station, for monitoring permafrost and active layer temperatures. A. Trindade will be participating in this campaign.

In the collaboration between the CEG-UL and the University of Buenos Aires (A. Caselli), R. Melo will be



Participants at the 1st Iberian Conference of the International Permafrost Association at the Paço da Cultura in Guarda. Photograph by M. Neves.

participating in the Argentinean campaign in January 2008 in Deception Island. She will be conducting detailed geomorphological mapping with to identify and survey permafrost degradation sites (i.e. thermokarst and debris-flow activity). The research is complimentary to the themes studied within the CEG-UL group, and intends to relate permafrost degradation in to climate change and volcanic activity in the island.

June 25-27 the 1st Iberian Conference of the IPA took place in Guarda, organised by the Centro de Estudos Geográficos of the Universidade de Lisboa and the Centro de Estudos Ibéricos and coordinated by G. Vieira. The general topic of the conference was 'Periglacial environments and climatic variations: from mountains to high latitudes' and the meeting welcomed more than 40 participants from Spain, Portugal and USA, and included lectures by J. Brown, R. Melo and A. Gomez-Ortiz. 19 communications and 15 posters were presented in the scientific sessions. Papers from the conference will be published in the Portuguese Geography journal *Finisterra*. The meeting is a continuation of the IPA-Spain series, which began in 1993. From now the meeting will be organised in collaboration between Spanish and Portuguese colleagues, and the next meeting, the Second Iberian Congress of IPA will be organized by Universidad de Alcalá de Henares (Spain) in June 2009.

The CEG-UL group has also been very active in the implementation of a national programme for polar research. A proposal has been submitted by the Portuguese IPY Committee to the Portuguese Science Foundation and is now under evaluation. In this proposal permafrost research plays a significant role, and has been taken as a priority by the Committee.

Portugal has been actively involved in the Permafrost Young Researchers Network with the participation of the national PYRN coordinator (R. Melo) in the Abisko

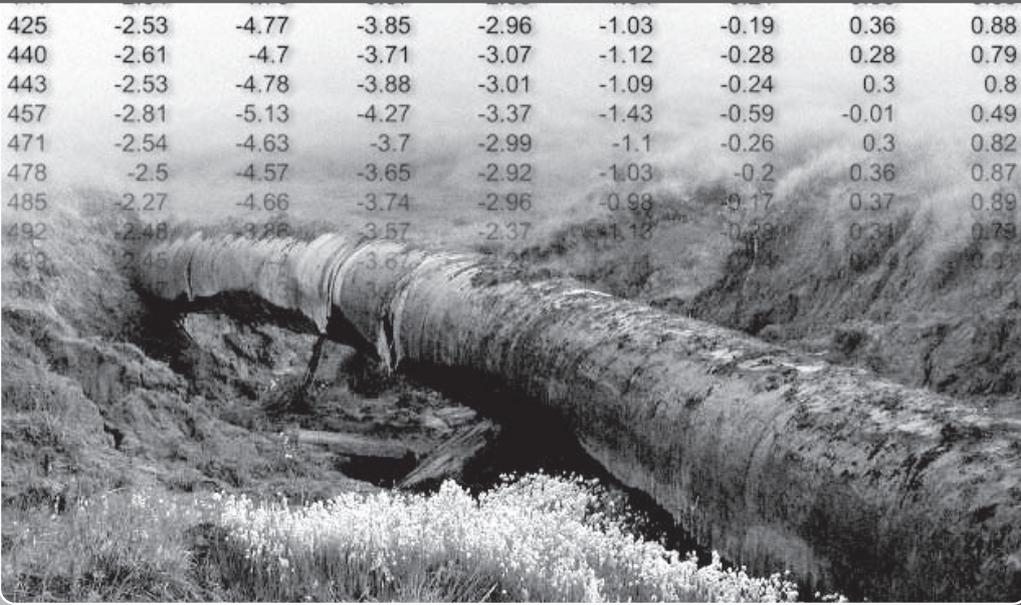
meeting in February 2007. A. Trindade is the national representative in the Association of Polar Early Career Scientists (APECS), and he attended the Stockholm meeting in September 2007.

Permafrost research has been also a major focus on IPY Education and Outreach activities. The CEG-UL group is co-coordinating (with the Centre of Marine Sciences - University of the Algarve and Association of Geography Teachers) the national IPY E&O project LATITUDE60! which links scientists to society during the IPY. The project is funded by the national agency *Ciência Viva*, and has been enthusiastically received by the public and more than 100 schools and 400 teachers have joined the project. The project is cross-cutting several disciplines and includes students from kindergarden to high school and university level. Several activities with a relationship to permafrost have been going on: 1) an exhibition that was

in five major shopping centres in central and northern Portugal; 2) an educational DVD on permafrost research to be distributed freely to schools; 3) permafrost scientists go to schools for talks; 4) IPY launch event with a focus on permafrost; 5) daily blogs by permafrost scientists; 6) ask a scientist with the participation of permafrost scientists answering from the Antarctic; 7) videoconference event from the Antarctic with permafrost scientists. One of the main activities was the national contest 'Discover the Polar Regions' that had more than 8,000 students involved. Five high school students were selected from the contest and offered trips to the Antarctic within the international expedition Students-on-ice. The blog of the project LATITUDE60! can be visited at <latitude60.blogspot.com>.

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|-----|-------|-------|-------|-------|-------|-------|-------|------|
| 425 | -2.53 | -4.77 | -3.85 | -2.96 | -1.03 | -0.19 | 0.36 | 0.88 |
| 440 | -2.61 | -4.7 | -3.71 | -3.07 | -1.12 | -0.28 | 0.28 | 0.79 |
| 443 | -2.53 | -4.78 | -3.88 | -3.01 | -1.09 | -0.24 | 0.3 | 0.8 |
| 457 | -2.81 | -5.13 | -4.27 | -3.37 | -1.43 | -0.59 | -0.01 | 0.49 |
| 471 | -2.54 | -4.63 | -3.7 | -2.99 | -1.1 | -0.26 | 0.3 | 0.82 |
| 478 | -2.5 | -4.57 | -3.65 | -2.92 | -1.03 | -0.2 | 0.36 | 0.87 |
| 485 | -2.27 | -4.66 | -3.74 | -2.96 | -0.98 | -0.17 | 0.37 | 0.89 |
| 492 | -2.48 | -4.88 | -3.57 | -2.37 | -1.12 | -0.23 | 0.31 | 0.73 |
| 493 | -2.45 | -4.7 | -3.67 | -2.4 | -1.12 | -0.23 | 0.31 | 0.73 |
| 500 | -2.47 | -4.7 | -3.67 | -2.4 | -1.12 | -0.23 | 0.31 | 0.73 |



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OTHER NEWS

NEPAL

In Nepal, the detailed scientific study of high altitude geomorphology started in the early 1970s under the project called Glaciological Expedition to Nepal (GEN) led by K. Higuchi of Nagoya University, Japan. Although the major objective of GEN was to obtain data on the state of glacier in the Himalayas, and to understand the relation between glaciers and climate, the periglacial morphology was also considered as the first step in the field of periglacial studies in the Nepal Himalaya. The results of these initial works were published in special issues of the Journal of the Japanese Society of Snow and Ice (SEPPYO) in 1976 and 1978. Since then significant work have been carried out in the field of glacier studies including glacier inventory, mapping, and Glacial Lake Outburst Flooding (GLOFs); however permafrost and periglacial studies received less attention. After a lapse of nearly 15 years, M. Jakob, in 1992, presented his discourse on the lower limit of permafrost in the Khumbu Himalaya. Following this Hokkaido University and Tribhuvan University undertook collaborative research on the geoecology of the Kanchenjunga area. Significant investigations were performed in periglacial and permafrost studies under the leadership of T. Watanabe. Miniature data loggers were extensively used to measure the BTS, rock surface temperature, and ground temperature profiles in eastern Himalaya. Rock glacier inventories were also made using detail aerial photographs interpretation. Electrical resistivity and seismic surveys were carried out to understand the present state of permafrost. Rockfall activity and the slow mass movement processes were also monitored by direct observation and by using strain probes, respectively. Gradually similar measurements were started in



Preparing to install temperature sensor in Nepal Himalayas. Photograph by D. Regmi

the central and western Nepal Himalaya. This project was interrupted in 2004 because of the political instability. At present the improved political situation allows for the restarting the periglacial and permafrost studies in the Nepal Himalaya. A Japanese group from Nagoya University has been active in the Khumbu Himal region under the project Cryosphere Research in the Himalayas (CREH). Some results of recent research are summarized in a paper and references submitted by the undersigned to NICOP entitled 'Rock Glacier Distribution and the Lower Limit of Discontinuous Mountain Permafrost in the Nepal Himalaya' and in a paper by the Japanese group by K. Fukui et al., 'Changes in the lower limit of mountain permafrost between 1973 and 2004 in the Khumbu Himal, the Nepal Himalayas' in *Global and Planetary Change*, 2007.

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ROMANIA

During the last year the activities of Romanian scientists interested in glacial and periglacial geomorphology continued in all branches of the Romanian Carpathians. The project 'The impact of the climatic changes upon the Holocene and present dynamics of the alpine environment from the Romanian Carpathians. Implications in the risk management and landscape's arrangement' (MEDALP) financed by CNCSIS (National Council for Superior Education Scientific Research) and led by P. Urdea (West University of Timișoara) and A. Vespremeanu-Stroie (University of Bucharest), continued with new investigation in the Retezat, Făgăraș and Șureanu mountains. The acquisition of a complex geophysical system PASI 16GS24 by West University of Timișoara opens new possibilities for investigations of some landforms and deposits of alpine areas in the Southern Carpathians. Application of 2D electrical resistivity tomography (ERT) began with measurements in the Făgăraș, Retezat and Șureanu mountains on different geomorphic landforms such as rock glaciers, scree slopes, solifluction lobes, fossil patterned grounds and a glacial overdeepening depression filled with postglacial sediments. ERT results of the Ana and Pietrele rock glaciers of Retezat Mountains indicated typical structures, and the presence of ice-rich bodies. The presence of permafrost in the area was also indicated by BTS measurements, and by the low temperatures ($< 2^{\circ}\text{C}$) of the springs situated at the base of the front of rock glaciers. Core samples were extracted from cores of glacial lakes and also tree rings for the reconstruction of the postglacial landscape.

In the summer 2007 ice caves, a particularly form of sporadic permafrost and/or extra-zonal permafrost, was

the focus of a team from the Department of Geology and Speological Institute *E. Racovitză* Cluj – Napoca. Led by B. Onac, the structure and thickness of ice of Glacier Scărișoara- (Apuseni Mountains) was explored with ground penetrating radar.

S. Simoni (University of Pitești) successfully finished his PhD dissertation *The Geomorphological Study of the Doamnei River Basin* in May 2007, with a part dedicated to glacial and periglacial landforms.

The teams of West University of Timișoara, University of Bucharest and University of Suceava continued the research on developing the chronology of the glaciation of the Romanian Carpathians, and to identify the palaeoenvironmental and palaeoaltitudinal zoning of the periglacial belt, permafrost and frozen ground conditions.

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ANTARCTIC PERMAFROST AND SOILS WORKSHOP

Seventeen members of the IPY project (33) Antarctic Permafrost and Soils (ANTPAS) from Argentina, Brazil, Italy, New Zealand, Portugal, Spain, U.S.A. met at the International Symposium on Antarctic Earth Sciences (ISAES) at Santa Barbara, California, in August 2007. The reviewed and reconfirmed ANTPAS objectives are to:

- Develop a common, web-accessible repository for permafrost and soils data.
- Produce thematic maps on Antarctic permafrost and soils.
- Develop a system of boreholes providing data on permafrost and soils properties, records of past environmental change, and recording permafrost responses to climate change.
- Support a well-designed monitoring system recording active layer and periglacial process responses to climate change along selected environmental gradients.

Main outcome of the workshop: The ANTPAS special issue of *Geoderma* has 13 papers and is expected to appear in print before the NICOP. The ANTPAS website contains all ANPAS meeting reports, other information, and will have a detailed report of this Santa Barbara workshop.

The Antarctic Master Directory (AMD) is a central directory system that contains Antarctic metadata. ANTPAS is listed as a project in the AMD. ANTPAS data needs to be tagged so that it is searchable for interest to ANTPAS investigators.

Good progress is being made on permafrost mapping (J. Bockheim), soil and permafrost mapping in the



The ANTPAS team at the Santa Barbara workshop. From left to right: J. Lopez-Martinez, J. Pulkonen, G. Claridge, J. Bockheim, R. Bonaccorsi, M. McLeod, D. Kowalewski, W. Dickinson, M. Balks, R. Raffi, S. Sega, D. Trombotto, M. Ramos, G. Vieira. Absent: C. Schaefer, M. Gooseff, K. Swanger. Photograph provided by M. Balks.

Antarctic Peninsula (J. Lopez-Martinez and C. Schaefer), active layer modelling (M. Ramos), spatial distribution of permafrost and relationship between surface air temperatures, solar radiation, geophysical observations, and permafrost (G. Vieira), soil mapping in the trans-Antarctic mountains (McLeod), South American rock glaciers (D. Trombotto), and active layer temperature monitoring and stream margin investigations (M. Gooseff). W. Dickinson explained the use of Be^{10} for soil dating and concluded that since it is subject to blowing in the dry Antarctic landscapes, it cannot reliably date surface ages.

R. Raffi presented an overview of the Italian Antarctic permafrost monitoring programme. It has CALM and borehole temperature monitoring sites in both the Antarctic Peninsula and Ross Sea Regions, and plans further sites to be added. Three, ice-wedge thermal monitoring sites were installed, and other ice-wedge sites were evaluated. The Italian programme has a widespread ecological monitoring network in the Ross Sea Region, including 19 permanent plots for long term monitoring. Concern was expressed for the position of Italian Antarctic researchers since no funding is currently being directed to support the Italian Antarctic programme. It was agreed that ANTPAS submit a letter of support for the Italian researchers, directed towards the Italian funding decision-makers.

Next ANTPAS workshop will be held during NICOP. For further information about ANTPAS or to join our listserv group please check out the ANTPAS website <www.earth.waikato.ac.nz/antpas>.

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CLIMATE AND CRYOSPHERE (CLIC)

The Climate and Cryosphere (CliC) project of the World Climate Research Programme (<wcrp.wmo.int>) in partnership with IPA is supporting a number of permafrost-





Participants at the 2nd Asia CliC Symposium. Photograph provided by A. Prick.

related initiatives. These included the preparation of the Integrated Global Observing System for Cryosphere (IGOS-cryo) Theme. This document was approved by the IGOS partners, and is now in transition to GEOSS. It addresses how well user requirements are met by the existing series of observations, including those of the global observing systems, and how they could be met in the future through better integration and optimization of remote sensing (especially space-based) and in situ systems. The Theme Report (found at igos-cryosphere.org) is the first document to bring all components together in a comprehensive manner to be used by decision makers for prioritizing needs, and by scientists for proposing science and observing initiatives. Implementation of CryOS observing networks will help insure that IPY is not just a short term activity, but that there remains a legacy of infrastructure, observational systems and data management systems after IPY. CliC has been involved in SAON (Sustained Arctic Observing Network), SOOS (Southern Ocean Observing System) and PAnthOS (Pan-Antarctic Observing System), and will help insure that all components of the cryosphere, including permafrost, are appropriately represented as these observing systems evolve.

In conjunction with the Arctic Monitoring and Assessment Programme AMAP (www.amap.no), CliC supported in 2007 an initiative on Arctic Carbon Cycle Assessment, with an AMAP/CliC/IASC Workshop on that theme held February 27-28 in Seattle, USA.

Asia-CliC is developing into a successful CliC regional group. An Asian-CliC workshop on 'Large-scale Hydrometeorology of Asian Cryosphere' held in Yokohama, Japan (May 17-19, 2007) engaged about 40 researchers in discussions related to the terrestrial cryosphere in the Asian region, and its role in the global climate system. A report of this workshop is being published. The 2nd Asia-CliC Symposium on 'The State and Fate of Asian Cryosphere' held in Lanzhou, China (October 22-26, 2007) engaged over 100 participants from 12 countries. It included a session on 'Frozen ground and permafrost conditions and changes'.

In 2007, CliC formally committed to support young

cryospheric researchers networks, to improve their participation to international meetings and the visibility of their research. CliC is planning joint activities with PYRN and the Association of Polar Early Career Scientists (APECS, see: arcticportal.org/apecs).

The CliC newsletter no. 9 (see: cllc.npolar.no) had a special focus on Mountain Cryosphere. It presented examples of mountain permafrost research and activities of groups linked to the IPA such as GAPHAZ and CRYONOR.

CliC has established a cryosphere 'specialist' list to help find experts to provide advice and serve on panels and committees. This has helped increase involvement of scientists in cryospheric initiatives, and provides a database for improved coordination in the future. Permafrost specialists are most welcome to register in the database cllc.npolar.no/specialists.

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INTERNATIONAL UNIVERSITY COURSES ON PERMAFROST IN RUSSIA

During summer 2007 two International University Courses on Permafrost (IUCP) were conducted in West Siberia, Russia, as part of the IPA's IPY activities.

Field Course in West Siberia 'Technogenic and Environmental Permafrost Observatories'. During July 2007, the Geography Faculty of Moscow State University and Tyumen State Oil and Gas University (TSOGU), in collaboration with U.S. and German institutions, conducted a 21-day summer field course in West Siberia entitled *Technogenic and Environmental Permafrost Observatories* (TEPO). Developed in 2005 as a field practice for students specializing in cryosphere studies at Moscow State and Tyumen State Oil and Gas Universities, the 2007 TEPO course was adjusted for international student audience.

The program attracted 27 undergraduate and graduate

students with diverse interests and backgrounds from Germany, Russia and the U.S. and involved six instructors specializing in different aspects of permafrost research. Instructors were V. Grebenets (Moscow State University), A. Kurchatova (TSOGU), E. M. Pfeiffer (Hamburg University), N. Shiklomanov (University of Delaware), A. Klene (University of Montana), and A. Boitsov (Tyumen State Oil and Gas University).

The course addressed three major topics of permafrost-related research: a) permafrost environments characteristic of the discontinuous and continuous zones; b) field instrumentation and techniques; and c) permafrost engineering and problems of development in permafrost regions. Geographically, the course was held at research sites along a north-south transect on the Tazovskiy Peninsula, from the southern limit of discontinuous permafrost near the city of Novyi Urengoi to the continuous zone at the industry camp of Yamburg.

Methodologically, the course consisted of systematic permafrost investigations at long-term monitoring sites and survey-type expeditions. Systematic, process-based investigations were conducted at a network of sites which constitute the TEPO established by A. Kurchatova in collaboration with the gas company NadymGasProm. The observation complex includes an array of 30-m deep boreholes equipped with automatic data collection systems and representing characteristic permafrost landscapes of West Siberia. Boreholes are complemented by sites for snow cover, vegetation, soil, ground ice, and geomorphologic investigations. As part of student research activities, four new Circumpolar Active Layer Monitoring (CALM) sites were established in proximity to boreholes for monitoring spatial distribution and long-term dynamic of the active layer. New sites represent diverse landscapes characteristic of the West Siberian previously underrepresented in the CALM network. Periodic monitoring of CALM sites, using standardized methodology will be conducted by faculty and students of TSOGU.

Permafrost surveys consisted of field trips focused on analysis of the landscape, permafrost conditions, ecology, vegetation, and climate characteristic of the discontinuous and continuous permafrost zones. Specific emphasis was made on the study of permafrost soils instructed by Pfeiffer and Kurchatova. Students learned the soil-forming factors that dominate in permafrost regions and their relation to major geomorphologic processes, vegetation, and ground thermal regime. Several field studies addressed geomorphologic processes and features characteristic of permafrost regions including thermokarst, thermal erosion, frost mounds, polygons, and frost boils. A significant portion of the course was devoted to the climatic, geocryologic, and geomorphologic history of West Siberia.

Throughout the course students were exposed to a wide range of field techniques, including surveying, coring, geothermal monitoring, thaw-depth measurements, landscape characterization, geomorphologic investigations, soil description and classification according to International, Russian, German, and U.S. classification schemes, and hydrologic and botanical field investigations. Data analysis and interpretation were also addressed.

West Siberia contains one of the world largest reserves of natural gas, and is undergoing extensive development. The impacts of modern resource extraction and urban developments were central foci of the field course. Three major gas fields (Yamburg, Yubileinoe, and Zapolyarno) and associated industrial complexes and settlements were visited as part of the field excursions. Pipelines, material sites, operating gas wells, processing plants, pump stations, and permafrost engineering testing facilities were visited. Generally, visitors are not permitted inside these secured facilities. The generous hospitality of GasProm and its staff was greatly appreciated. A number of executives met with the group at Yamburg (GasDobucha; a regional GasProm subsidiary). Difficult issues related to environmental protection, indigenous people, energy security, and policy were very openly discussed at headquarters in Novyi Urengoy. Several field trips were devoted to modern permafrost engineering.

The field work was complemented by daily lectures prepared by instructors and students, covering a wide range of topics. Students also participated in active permafrost research through daily data collection and analysis activities. Analysis of the diverse data sets obtained during the course is underway at Moscow State University, and a detailed report is in preparation. The outreach activities included several articles written by students and instructors for local and industry newspapers and magazines and participation in regional TV program devoted to IPY and permafrost in the West Siberia.

The TEPO course was made possible largely through generous support from GasProm and its regional subsidiaries NadymGasProm and YamburgGasDobucha. These organizations and the Russian office of Conoco-Phillips provided transportation, accommodation, and meals throughout the course. The next international TEPO course will be offered in July 2008. For information please contact V. Grebenets (vgreb@inbox.ru) and A. Kurchatova (kanni@mail.ru) in Russia and/or N. Shiklomanov in the U.S. (shiklom@udel.edu).

Field course 'Permafrost and Periglacial Geomorphology of Western Siberia and Western Taimyr'

This 10-day course was developed jointly by faculty of the Geography Department of Moscow State University and researchers from the Earth Cryosphere Institute,

and offered at the end of July to the beginning of August 2007. The course was held on board the “Fedor Naianov” vessel, which sailed on Enisey River from the town of Dudinka to the port of Dikson on the Arctic Coast. The course attracted six Russian upper level undergraduate and graduate students from Moscow State and St. Petersburg State Universities. Course instructions were provided by I. Streletskaya (Moscow State University) and A. Vasil’ev (Earth Cryosphere Institute, Russian Academy of Science).

The main topics of the course were 1) Landscape-specific permafrost conditions characteristic of the lower Enisey river region; 2) Ground ice, crystallography and cryolithology; 3) Quaternary history of Western Taimyr, 4) Field methods of geomorphologic investigations. The course consisted of extensive field excursions at nine stops along Enisey, and lecture series and laboratory work on board of the ship.

Students participated in applied geocryologic, geomorphologic, biologic and Quaternary research activities to study the spatial distribution of major landscapes, vegetation, and soil along the prime climatic gradient from Dudinka to Dikson; the study of geologic cryogenic structures of Pleistocene sediments; collection of characteristic vegetation, soil, sediment samples and collection of ground ice samples for isotopic analysis.

The course was funded by Moscow State University, Earth Cryosphere Institute, State Research Institute of Ocean Geology (St. Petersburg, Russia) with generous support from Russian office of Conoco-Philips, Enisey River Shipping Company (Krasnoyarsk, Russia) and Russian State Nature Preserve “Great Arctic” (Dudinka, Russia). The course is expected to be offered again in July-August 2008. For Information please contact I. Streletskaya (strelets@gol.ru).

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Irina Streletskaya (strelets@gol.ru)

ATLAS OF NORTHERN CIRCUMPOLAR SOILS

In recent years, interest on soil in northern latitudes has increased significantly among general public and policy makers. This special territory, sparsely populated and rich in natural resources (wood, oil, gas, rare metals, etc.), is projected to undergo the greatest impact from global warming, and which can have a major effect on principle soil-forming processes regulating ecosystems functioning and biogeochemical cycles. Meeting this interest, soil scientists have focused efforts to improve our knowledge of the circumpolar soils. However, the results are mainly addressed to professionals and are poorly known by general public. Soil scientists from Canada, European

Union, Russia and USA are collaborating to close this gap by producing an Atlas of Northern Circumpolar Soil (V. Stolbovoy, A. Jones, C. Tarnocai, G. Broll and L. Montanarella, among others authors). This publication intends to raise public awareness of the value of soil in the north and support further research in this area (for example, the European Union’s Thematic Strategy for Soil Protection (COM(2006) 231; COM(2006) 232).

The Atlas comprises the following chapters: Introduction including major definitions and geographic conditions; Characteristic of Northern Latitudes soil types; Classification of soil in the USA Soil Taxonomy, Canadian and Russian Systems, which are correlated in the International World Reference System (WRB); Soil maps derived from Northern and Mid latitudes soil database on Alaska and Canada and European Geographical Soil Database of the Northern Eurasia; Northern Soils and Global Change containing information on the role of the northern soil in carbon cycle at present and predicted changes for the future due to global climate change; Local and regional perspectives include examples from Scandinavia, Iceland, Greenland, Canada, Alaska and Central Siberia; Education and Glossary. Technically the Atlas is a book of 128 A3 Pages illustrated by text, coloured maps, pictures, diagrams and photographs. The atlas is planned to be published in 2008 and will be launched at the EUROSOIL 2008 Congress in Vienna. A 2008 calendar illustrating the Atlas has been issued by the JRC in conjunction with the IPY <eu soils.jrc.it>. For further information see <eu soils.jrc.ec.europa.eu/library/maps/circumpolar/index.html>.

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PYRN NEWS

The Permafrost Young Researchers Network (PYRN), established as an IPY education and outreach activity of the IPA in November 2005, continues its success, now gathering approximately 400 members from 35 countries. The new website, <pyrn.ways.org>, provides a number of new features specifically aimed at improving communication and networking among young researchers, including blogs, podcasts and links to the World Association of Young Scientists. The 2007 PYRN best presentation awards were presented at the International Conference “Cryogenic processes of polar regions” held in Salekhard in June to three young scientists from Russia and Poland. The PYRN bibliography (PYRN-Bib) now contains over 200 theses and dissertations from permafrost scientists and engineers. A global list of senior scientists involved in



permafrost research is currently being compiled and will be released in January 2008. PYRN also organized two highly successful events in 2007. 11 PYRN national representatives met at the Abisko Scientific Research Station February 23-25 to review and plan PYRN activities. Further, PYRN organized the first OSL-APECS-PYRN training workshop at the Otto-Schmidt-Laboratory (OSL) in St.-Petersburg (November 29 – December 2) joined by 50 young researchers from 13 countries. The workshop provided an insight in the latest techniques and methods used in fields as diverse as permafrost modelling, investigations of mountain ice segregation, bubbling from thermokarst lakes and submarine permafrost detection. It brought together experts from the USA, Germany, Switzerland and Russia to provide young investigators with a multidisciplinary and cross-border perspective on permafrost research, a much-needed approach. In addition future plans to address climate change issues in permafrost areas were discussed. The workshop was sponsored by the German Federal Ministry of Education and Research, the Leibniz Institute for marine science IFM-GEOMAR, the International Arctic Research Center, the IPA, CliC and the Alfred Wegener Institute for Polar and Marine Research. PYRN plans to organize

a similar workshop at the same time in 2008. During NICOP, PYRN will be hosting activities including a panel discussion on careers in permafrost science. PYRN members will also contribute to the Melnikov Centenary International Forum for Young Scientists: The Present and Future of Geocryology in Yakutsk, Russia, August 5-28, 2008 (invitation available at <www.ipa-permafrost.org>, contact: YanaS_82@mail.ru or mpi@ysn.ru).

To carry the responsibility of assessing the impacts of warming permafrost until the next IPY in 2032, young permafrost researchers launched the PYRN-TSP (Thermal State of Permafrost) project. The project is conducted in partnership with the IPA and its officially endorsed IPY TSP project. Small teams of young scientists equipped with lightweight drills will travel to understudied areas of the Arctic, Antarctic and mountainous regions, and will drill boreholes to establish temperature monitoring, which will be presented at the NICOP conference in 2008. The results will feed into the global database on permafrost temperatures GTN-P, which will provide the scientific community with standardized temperature measurements of virtually every permafrost region of the Earth.

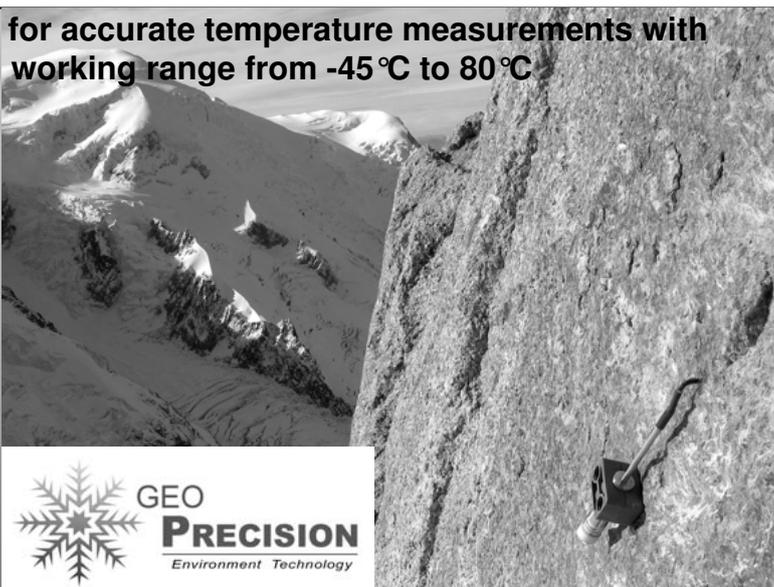
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PUBLICATIONS

All past issues of *Frozen Ground* have been scanned and are now on the IPA web <www.ipa-permafrost.org>

Global Outlook for Ice and Snow - UNEP, Hertfordshire, England: Earthprint Ltd. 2007. 235 pages. ISBN: 9789280727999. USD 40.00. Ordering possible at: <www.earthprint.com>.

Practical Dictionary of Siberia and the North (Severnaja entsiklopedija) - Akbaljan E., Golubchikova V., Khvtiashvili Z., Paris: Publications Maecenas 2004. 1200 pages, with CD-ROM. ISBN 5-98797-002-4. EUR 92.59 / USD 117.82. In Russian: Moscow: Evropejskie izdaniya 2004. ISBN: 5-98797-001-6. Title nr 101407. EUR 138.89 / USD 176.71. E-mail: andreas.agopov@ruslania.com. Ordering possible at: <www.ruslania.com>.

National Atlas of the Republic of Kazakhstan - Institute of Geography, compiled in three volumes.

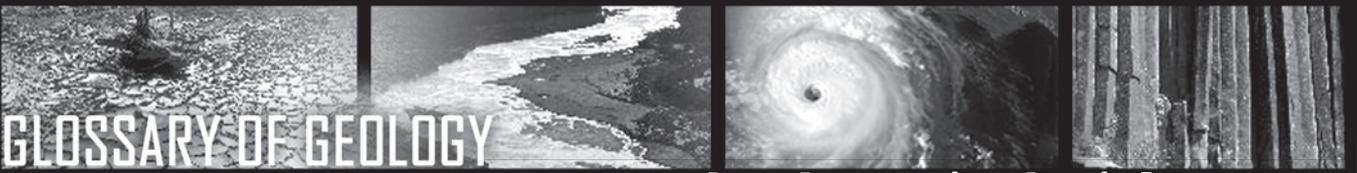
Late Cenozoic of Patagonia and Tierra del Fuego, 11 - Edited by Jaap van der Meer and Jorge Rabassa, The Netherlands, Elsevier, Publication date: May 2008.

430 pages. ISBN-13: 978-0-444-52954-1, ISBN-10: 0-444-52954-3. GBP 115 / USD 195 / EUR 160. Ordering possible at: <www.elsevier.com>.

Geocryological Map of Russia and Neighbouring Republics English language version, Second Edition - Moscow State University, Cambridge University, and GSL Network, Canada. For information and to view samples, please visit: <www.freezingground.org/map> or contact: map@freezingground.org

The First State of the Carbon Cycle Report (SOCCR): The North American Carbon Budget and Implications for the Global Carbon Cycle has been completed. The official release can be found at: <http://www.climate-science.gov/Library/sap/sap2-2/final-report/default.htm> Printed copies will be available during the winter of 2008.

An update of the monograph on the *Norman Wells pipeline performance* (originally published in 1999 as Geological Survey of Canada Open File 3773) will be released December 1, 2007 as Open File 5702. The Monograph was prepared in collaboration with Enbridge Pipeline NW, AMEC and NAVIQ.



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PLANNING CALENDAR

The following meetings share common interests with the IPA Membership and Working Parties. The list is not all inclusive, but is intended to help avoid overlaps in scheduling future IPA and other international meetings. Please send corrections and additions to the IPA secretariat (ipa@unis.no). Readers are referred to web sites or individual email contacts for more information.

2008

- January 20-25, Arctic Frontiers 2008; Session on Dynamics of Permafrost and the Consequences of Climate Change, Tromsø, Norway <<http://www.arctic-frontiers.com>>
- March 26-April 2, Arctic Science Summit Week, Syktyvkar, Komi Republic, Russia <<http://www.assw2008.org>>
- April 13-18, European Geosciences Union, Vienna, Austria <www.meetings.copernicus.org/egu2008>
- April 21-24, The International Conference 'Cryogenic Resources of Polar and Alpine Regions. State and outlook of engineering Geocryology'. Conference dedicated to 100th anniversary of Academician Pavel. I. Melnikov, Tyumen, Russia. <www.permafrost2008.ru>
- June 22-26, Contaminants in Freezing Ground (CFG6), Fairlee, Vermont, USA <ipy.crrel.usace.army.mil/cfg6>
- **June 29–July 3, Ninth International Conference on Permafrost, Fairbanks, Alaska, U.S.A.** <www.nicop.org>
- July 6-10, 6th International Conference on Gas Hydrates, Vancouver, Canada <www.icgh.org>
- July 6-11, 18th International ISOPE-2008, Vancouver, Canada <www.iso-pe.org>
- July 8-11, Joint SCAR-IASC Open Science Conference, St. Petersburg, Russia <www.scar.org>
- August 5–14, 33rd International Geological Congress, Oslo, Norway <www.33igc.org>
- August 15–20, 31st Congress of the International Geographical Union, Tunis <www.igu-net.org> and <www.agt.org.tn>
- August 5 - 28, Melnikov Centenary International Forum for Young Scientists: The Present and Future of Geocryology, Yakutsk, Russia. Invitation available at <www.ipa-permafrost.org>, contact: YanaS_82@mail.ru or mpi@ysn.ru. Pre-Registration by April 10, 2008
- August 25-29, Eurosoil 2008, Vienna, Austria <www.ecss.net/congress.htm>
- September 8-11, 10th International Symposium on High Mountain Remote Sensing Cartography, Kathmandu, Nepal <menris.icimod.net/HMRSC-X>
- September 25-26, The scientific - practical conference 'Hydrogeology, Engineer Geology, Geocryology and Geocology of Transbaikalia and the contiguous territories' (HEGGGT-2008), Chita, Russia
- December 15-19, American Geophysical Union Fall Meeting, San Francisco, California, U.S.A. <meetinginfo@agu.org>; annual meeting of U.S. Permafrost Association <www.uspermafrost.org>

2009

- April, European Geosciences Union, Vienna, Austria <www.copernicus.org/EGU>
- May, Pushchino, Russia. Contact: <gilichin@issp.serpukhov.su>
- September, ASCE's 14th International Specialty Conference on Cold Regions Engineering, Duluth, Minnesota.
- December, American Geophysical Union Fall Meeting, San Francisco, California, U.S.A. <meetinginfo@agu.org>; annual meeting of U.S. Permafrost Association <www.uspermafrost.org>

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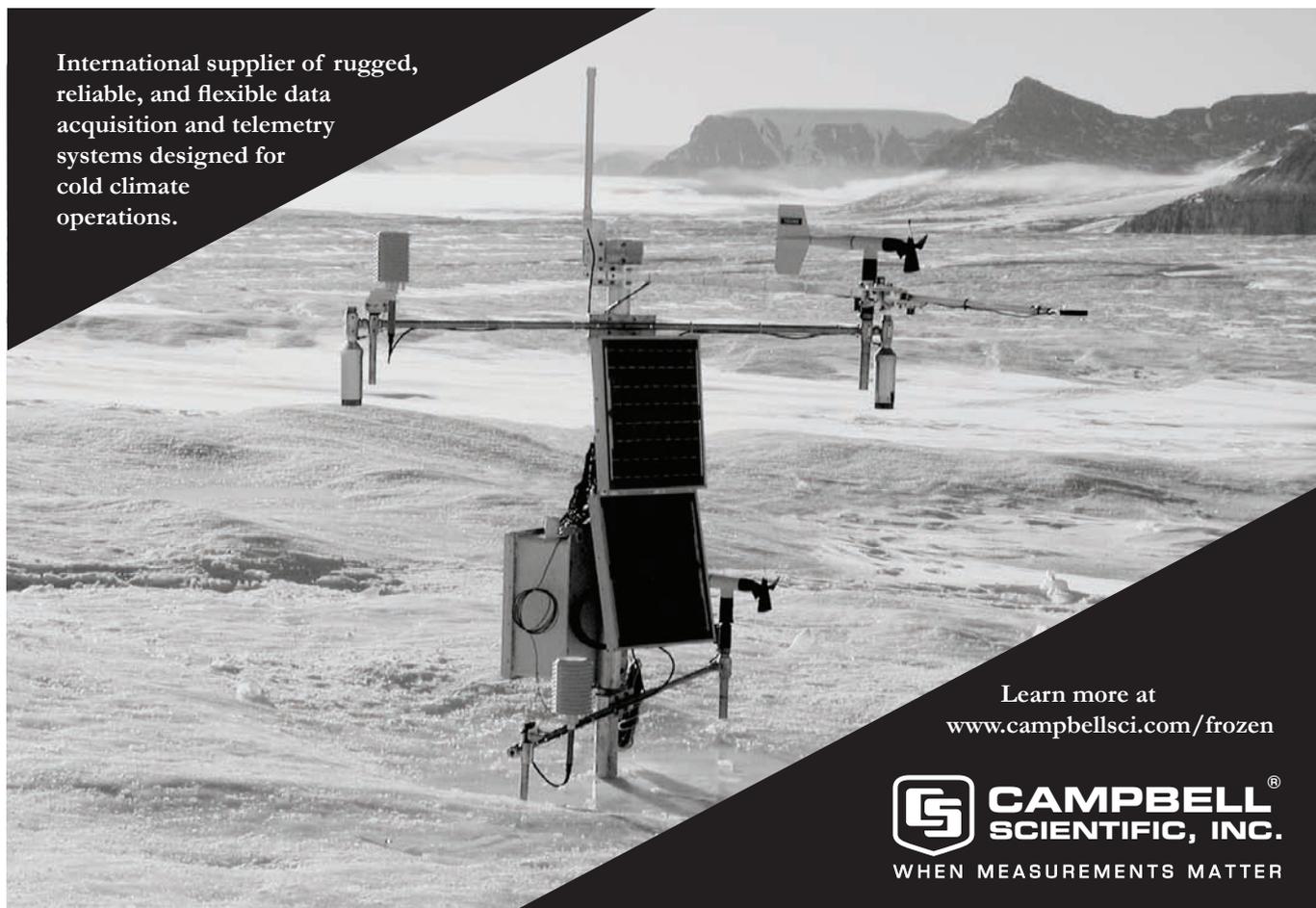
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