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ICE

INTERNATIONAL GLACIOLOGICAL SOCIETY

Diary of meetings

1983 27 June–1 July: Symposium on Ice and Climate Modelling, Northwestern University, Evanston, Illinois, U.S.A.

1984 2-7 September: Symposium on Snow and Ice Processes at the Earth's Surface, Sapporo, Japan.

1985 26-29 August: Symposium on Glacier Mapping and Surveying, Reykjavik, Iceland.

1986 7-12 September: Second Symposium on Remote Sensing in Glaciology, and 50th Anniversary Celebrations of IGS, Cambridge, England.

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ICE

NEWS BULLETIN OF THE INTERNATIONAL GLACIOLOGICAL SOCIETY

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CONTENTS

A report on the presentation of the Seligman Crystal to Dr Marcel de Quervain at the Second Applied Glaciology Symposium will appear in the next issue of ICE.

Some readers may notice that this issue of ICE is a little thinner than usual. Unfortunately there has been a reduction in the number of reports on recent work received. Members of the IGS and others involved in glaciological work that they would like to see reported in ICE should forward their reports to the Editor through their National Correspondents; these are listed inside the front cover of the Journal of Glaciology.

COVER PICTURE: Courtesy of Keystone Press Agency Limited, Fleet Street, London

RECENT WORK

AUSTRIA

This report covers the investigations carried out in the years 1978-1982 by the following Austrian institutions: Alpenverein (ÖAV); Institut für Hochgebirgsforschung (AFO), Institut für Bodenmechanik, Felsmechanik und Grundau (IBI), Institut für Geographie (IGI), Institut für Mathematik (IMI), Institut für Meteorologie und Geophysik (IMGI), Physikalisches Institut (IPI) and Institut für Medizinische Physik (IMPI), all of the University of Innsbruck; Institut für Elektronik, Technische Universität Graz (IEG); Institut für Wildbach- und Lawinenverbauung, Universität für Bodenkultur Vienna (IWL); Zentralanstalt für Meteorologie und Geodynamik in Vienna (ZA), with Wetterdienststelle Innsbruck (WDI). The work of groups missing here will be included in a future report.

GLACIERS

GLACIER VARIATIONS (ÖAV)
Observations have been continued on 112 Austrian glaciers. The general advance reached a peak in 1980, when 72% were advancing, 9% stationary and 19% retreating. More glaciers have started retreating since, especially after the exceptionally warm summer and fall of 1982 which brought extreme mass losses to most of them.

AUSTRIAN GLACIER INVENTORY
The inventory has been completed by G. Gross (IGI) and G. Patzelt (AFO): a total of 925 glaciers cover 542 km^2. The data have been transmitted to the Temporary Technical Secretariat for the World Glacier Inventory at ETH Zürich.

KESSELWANDFERNER
The seasonal variations of the water table in the accumulation area of Kesselwandferner have been investigated by W. Ambach (IMPI) and H. Eisner (IPI) who also studied the melt water flow in the water table using dye tracers.

From samples of a 20 m deep bore hole in the accumulation area of Kesselwandferner the total-ß-activity and half-life have been analysed and compared to the total-ß-activity of samples from the North Water, northwest Greenland and Axel Heiberg Island, supplied by the Geographisches Institut, ETH Zürich. From the activity maximum in the 1963 horizon, averaged values of the net accumulation were obtained.

The solar UV-A and UV-B radiation and the UV albedo of snow were measured in the accumulation area of Kesselwandferner and on Internationale Forschungsstation Jungfraujoch (Switzerland).

Eleven years of strain measurements in a 20 m deep firn pit in the accumulation area of Kesselwandferner were analysed.

A precision survey of the stake profiles on Kesselwandferner has been continued by H. Schneider (IMI). The mass balance of Kesselwandferner ($\bar{b}$ in kg m^{-2}) was determined by G. Markl (IMGI) as follows: 1977/78 = 420, 78/79 = 70, 79/80 = 160, 80/81 = 160.

HINTEREISFERNER
A 30-year record of mass balance was completed in October 1982 by members of IMGI. Recent values of $\bar{b}$ (kg m^{-2}) were: 1978/79 = 20, 79/80 = -50, 80/81 = -170.

A 1:10,000 scale map has been produced of Hintereisferner and of the terminus of Kesselwandferner in 1979. G. Kaser (IMGI) continued direct measurements of evaporation at the equilibrium line and at the terminus. With the resulting estimate of areal evaporation, all terms for the water balance have been evaluated for the basin of Rofenache.

In 1982 the thickness of the lower part of the glacier was determined with radio-echo sounding by H.-P. Wächter of VAWE, ETH Zürich, in cooperation with IMGI. Values ranging from 50 to 266 m and a series of three basins and sills were found from one longitudinal and 13 transverse profiles. Results are in good (5 m) agreement with the values Hess obtained by mechanical drilling in the 19th century.

SCHWARZMILZFERNER
A study of the mass balance, climate and history of this small glacier was initiated by J. Schug (INGI) in 1981. Schwarmilzferner is situated on the main chain of Allgäuer Alpen at the wet northern rim of the Alps, where equilibrium line altitudes are as low as 2500-2600 m.

STUBACHER SONNBLICK
Mass balance studies of Stubacher Sonnblickkees and Filleckkees were continued by H. Slupetzky (Institut für Geographie, Universität Salzburg), who reports the following data for mean specific balances (kg m^{-2}).

	Sonnblickkees	Filleckkees
1978/79	224	127
1979/80	834	856
1980/81	415	

A weather station installed in Rudolfshütte (2300 m) in 1982 will be in year-round operation.

PASTERZE
Similar to Stubacher Sonnblickkees, Pasterze had an extremely positive mass balance in 1979/80. There are no exact figures for the entire glacier, but geodetic measurements of surface elevation and ice velocity are carried out annually by H. Wakonigg (Geographisches Institut, Universität Graz).

GOLDBERGGRUPPE
R. Bühm and N. Hammer (ZA) started some new activities in 1981. Maps at a scale of 1:5000 have been drawn of Goldberggletscher, Kleiner Sonnblickkees and Wurtenkees for 1953 and 1979. Wurtenkees, which is now being studied in detail, has displayed an anomalously rapid decay from 1967 to 1979: average specific balance was -430 kg m^{-2} per year in that period.

PALEOGLACIOLOGY
Extensive mapping of late glacial moraines and rock glaciers has been continued by Hanns Kerschner (IGI) in the Stubai Alps and Ötztal Alps and in southwestern Switzerland in close cooperation with H.-N. Müller (Department of Geography, Universität Zürich). The aim of these studies is to establish a complete stratigraphy of glacial events during the Alpine Late Glacial on the basis of morphological characteristics of the moraines and rock glaciers and snowline altitudes. An absolute chronology was attempted with the help of pollen analysis and ^{14}C dating, but progress has been rather slow. It could be shown that the Younger Dryas cold phase (11,000 - 10,000 B.P.) correlates with the widespread Egesen stadial of the glaciers. The end of the Alpine Late Glacial can be fixed at the Younger Dryas/Preboreal transition.

Paleoclimatic studies with changes in the altitude of timberline, snowline and the lower boundary of discontinuous permafrost as input data show that precipitation was considerably lower in the sheltered regions of the Tyrolean and Swiss Alps during the Younger Dryas, but reached modern values at the northern fringe of the Alps. Summer temperatures during this period were about 2.5 - 3°C lower, annual temperatures dropped by about 3.5 - 4°C.

SNOW

REMOTE SENSING OF SNOW & ICE
Investigations of the seasonal snow cover and on glaciers have been carried out by H. Rott (IMGI) with satellite and aircraft remote sensing data. An interactive image processing system was used for data analysis. With LANDSAT MSS data, classification algorithms for interactive mapping of the seasonal snow cover were investigated. In cooperation with the Institute of Applied Physics, University of Berne, automatic algorithms have been developed for mapping extent and other parameters of the global snow cover from NIMBUS-7 Scanning Multichannel Microwave Radiometer Data. In July 1981 aircraft Synthetic Aperture Radar data in X- and C-band were acquired from a glacierized region of the Ötztaler Alps. Interpretation of these data in respect to snow cover and glaciers is going on. In preparation for this experiment, SEASAT-SAR data were investigated with respect to their glaciological information.

WATER PERCOLATION
In 2-4 week field experiments the influence of snow metamorphism on melt water percolation and on the water retention capacity (irreducible water saturation) was studied by A. Denoth (IPI). In order to be independent of weather conditions, melt water fluxes in the range $\leq 10^{-5}$ $m^3 m^{-2} s^{-1}$ have been simulated; the outflowing water volume has been recorded continuously. The particle speed has been measured by marking the melt water with a fluorescent dye tracer (Fluorescene or Rhodamine); water samples have been taken automatically every 15 minutes. Also, the formation of water shock-fronts and their velocity of propagation has been studied.

ELECTROMAGNETIC PROPERTIES (IPI)
The investigation of the dielectric properties has been extended to lower frequencies (static dielectric constant) and to higher frequencies up to 100 MHz and up to 1 GHz since 1982, using a network analyzer. The influence of snow structure properties (grain size, grain shape, porosity), liquid water content and the influences of liquid distribution is well understood.

It has been shown that the snow can be characterised by the static dielectric constant. Both photographic analysis and characterisation by the static dielectric constant are most suitable for application to wet snow.

Based on the investigation of dielectric properties, two different types of snow moisture meters have been developed: (a) for measuring the average water content in a volume, and (b) for measuring the water volume in 2 and 4 cm thick layers. With the latter system, changes in gradients and water content near the snow surface can be detected. Microprocessor controlled versions of these moisture meters are under construction.

Low temperature measurements (from 0°C down to -200°C) of the dielectric behaviour of snow were started at the end of 1982. The aim is to measure and explain the various relaxation-dispersion processes in snow at different stages of metamorphism.

SNOW LOADS
K. Gabl (WDI) evaluated 11,000 measurements of snow water equivalent at 400 Austrian stations in order to derive the statistical distribution of maximum snow loads on buildings in the country. His results could be verified by data on the abundant snow cover of the two winters 1980-82.

F. Fliri (IGI) established the probabilities of certain snow depths on the ground for 10-day intervals for valley and mountain stations in the Tyrol and neighbouring Trentino.

AVALANCHES

SAFETY EXPECTATIONS FOR AVALANCHE PROTECTION

H. Aulitzky (IWL) has established the present-day safety expectations for various measures of avalanche protection by means of a Delphi poll. The three groups interviewed (research, engineering, forecasting) unanimously put highest expectations into permanent defence structures like snow bridges while temporary measures were trusted least. Their opinion on other topics differed quantitatively, but there was agreement that avalanche protection could be improved by technological effort. Avalanche forecasting and active protection were least in the scale of confidence.

ELECTRONICS AND AVALANCHES

The late W. Fritzsche and H.Schlögel at IEG continued the development of instruments and methods for the location of avalanche victims and glacier crevasses. Doppler radar is being applied to telemetry of avalanche release in the vicinity of roads.

SLAB AVALANCHES

The nivological, meteorological and topographical parameters relevant to the rupture of snow slabs and the subsequent avalanche release are being investigated by B. Lackinger (IBI). A permanent measuring site has been established on the slopes of Nordkette near Innsbruck,where slab avalanches are a threat to ski slopes. Sliding velocities and microseismics are being recorded.

Geotechnical problems ensuing from extreme geologic conditions and topographic situations of avalanche defence structures are being investigated in an interdisciplinary project.

M. Kühn

SWEDEN

GLACIOLOGICAL RESEARCH AT TARFALA

During 1982 the usual mass balance, meteorological and hydrological measurements that have been in progress for many years were continued. A 20-stake strain net on Storglaciären, consisting of a 4 stake x 5 stake grid, with 125 m spacings, was surveyed at about 10-d intervals in the summer and 45-d intervals in the winter. This strain net will now be replaced with a larger 28-stake net established in May and June 1982 and covering the entire glacier. Six holes were bored to the base of the glacier for water pressure measurements, but unfortunately none made contact with the subglacial water system. Evidently the more sluggish movement of Storglaciären (peak summer velocity ca. 40-45 mm/d), as compared with other glaciers on which this experiment has been tried, is accompanied by a less extensive subglacial water system. Finally a 23-stake net covering nearby Rabots Glaciär was surveyed twice this past summer, once in early July and again in early August.

The mass balance data have not been fully reduced, but it appears that the mass balance was strongly positive.

The results from the 20-stake strain net are quite interesting. It appears that the early summer increase in sliding speed begins down-glacier from the net and migrates up-glacier. Similarly the late summer decrease in sliding speed also begins low on the glacier and migrates up-glacier through the strain net. The peak horizontal velocity over the net precedes the peak vertical velocity by about two weeks, suggesting that the increase in sliding speed in the early summer is more a consequence of a build up in pressure than of an increase in separation at the bed. The high vertical velocities which follow are attributed in part to increased separation at the bed and in part to higher-than-average longitudinal compressive strains. The separation at the bed apparently results in reduced water pressure, perhaps due to opening of the subglacial drainage system, as horizontal velocities begin to decline while vertical velocities are still high.

The first of the surveys on Rabots Glaciär has been reduced, and an immediate result is that longitudinal strain rates are substantially lower on Rabots Glaciär than on Storglaciären. This may explain why Rabots Glaciär seems to respond more sluggishly to climatic stimuli, as indicated by the fact that it has only one moraine dating from the early part of this century whereas Storglaciären has four.

During the past year the following papers have been published or prepared for publication.

Björnsson, H., 1981. Radio-echo sounding maps of Storglaciären, Isfallsglaciären and Rabots Glaciär, Northern Sweden. Geografisker Annaler, Vol.63, Ser.A, 225-231

Brzozowski, J. and Hooke, R. LeB., 1981. Seasonal variations in surface velocity of the lower part of Storglaciären, Kebnekaise, Sweden. Geografisker Annaler, Vol. 63, Ser.A, 233-240.

Schytt, V., 1981. The net mass balance of Storglaciären, Kebnekaise, Sweden, related to the height of the equilibrium line and to the height of the 500 mb surface. Geografisker Annaler, Vol.63A, 219-223.

Holmlund, P. and Hooke, R. LeB. High water-pressure events in moulins,Storglaciären, Sweden. (Submitted to Geografisker Annaler, November, 1982)

Hooke, R.LeB., Gould, J. and Brzozowski, J. Near-surface temperatures near and below the equilibrium line on polar and subpolar glaciers. (Submitted to Geografisker Annaler, November, 1982)

Hooke, R.LeB., Brzozowski, J. and Bronge,C. Seasonal variations in surface velocity, Storglaciären, Sweden. (In preparation)

Valter Schytt and Roger LeB. Hooke

U.S.A. – ALASKA

VARIEGATED GLACIER SURGE STUDIES
(W.D. Harrison, Univ. of Alaska; C. Raymond, Univ. of Washington; B. Kamb and H. Engelhardt, California Institute of Technology)

In 1973 the Universities of Alaska and Washington, later joined by the California Institute of Technology, initiated a study of the causes of glacier surges, catastrophic advances that are unrelated to climate changes. In singling out a glacier for intensive field studies a prime concern was that the glacier be one with a well-documented history of past surges, so its future behaviour could be predicted. The choice, Variegated Glacier, in South-East Alaska near Yakutat, which last surged in 1964-1965, was an excellent one. It began its surge at about the expected time except for one key factor: that time was in the dead of winter, January 1982, and not in spring as anticipated. This was a surprise because it was known from the evolution of the seasonal behaviour of the glacier over the last 10 years that the entry of water into the glacier plays a key role in its motion.

Fortunately, due to repeated surveying, a network of time lapse cameras, special geophysical and outlet stream measurements, and borehole drilling to observe subglacial water pressure, the progress of the surge has yielded a wealth of new information. Up to late summer 1982, the surge had strongly affected only a part of the glacier, the main branch draining the main accumulation basin (but not that basin itself) down to about the equilibrium line, and the major tributary. The main branch increased in speed more or less exponentially to 10 m/d until late June when it dropped by a factor of two in a half-hour period. Except for several notable but brief spurts, the speed continued to decrease until September. A marked acceleration began in late October, and by late January 1983 the speed was back up to the June peak. Water vapor was seen streaming from several crevasses in January, evidently from water near the surface. In mid February 1983 the speed was only about half as great as in January.

The importance of water, both in winter and summer, is now evident. For example, shortly after the sudden interruption of the surge in June a flood of water emerged from the stream at the glacier terminus. Its passage down and under the glacier was marked by a brief acceleration of the lower part of the glacier that up to then had been affected only weakly by the surge activity. A similar flood occurred in early February, and was probably associated with a drop in speed then. Brief motion events, also associated with water, were observed for several years prior to the surge activity.

FOURTH INTERNATIONAL CONFERENCE
ON PERMAFROST

By October 1982 some 450 abstracts had been received and reviewed. By the deadline for papers 280 had been received and the Soviet papers were beginning to arrive. The bulk of the papers are distributed by country of origin as follows: U.S.A. (133), U.S.S.R. (70), Canada (55), People's Republic of China (40), Japan (9), Germany (8) and the U.K. (6).

Gunter Weller

PROFILE

DEPARTMENT OF GLACIOLOGY – INSTITUTE OF GEOGRAPHY U.S.S.R. ACADEMY OF SCIENCES MOSCOW U.S.S.R.

Glaciology in the Soviet Union received special attention and began to develop rapidly in the period of the International Geophysical Year (IGY). It was initially with a view to the IGY that the first special team of glaciologists in the Soviet Union - the Department of Glaciology of the Institute of Geography, the USSR Academy of Sciences, was constituted. It was established by Professor G.A. Avsiuk, who was heading up the Soviet IGY glaciology program.

Right from the start the scientific staff of the Department included several dozen specialists, but nearly all were away from Moscow at that time, working at manned glaciological research stations in Antarctica, Franz Josef Land, Novaya Zemlya and the Polar Urals. The Department maintained three of the eleven glaciological stations operated in the USSR during the IGY.

Scientific activities of the Department began early in the 60's when processing of the ample data received during the IGY was undertaken along with broad field research on the glaciers of the Polar Urals, Caucasus and Central Asia. In 1960 and 1961 the "Data of Glaciological Studies of the IGY" series was published, containing in its dozens of volumes the primary observational data from all the glaciological stations for 1957-1959. Later on results of these investigations were summarized in the co-authored monographs: "Glaciers of the Urals" (1966), "Glaciers of Novaya Zemlya" (1968) and "Glaciers of Franz Josef Land" (1973).

Results of Antarctic investigations were depicted on a number of maps in the Atlas of Antarctica (1964) and reflected in the still earlier monographs - "Snow cover in the Antarctic and its role in modern glaciation of the Continent" (1961) by V.M. Kotlyakov and "Geological activities of the East Antarctic Ice Sheet" (1963) by S.A. Evteev. The former was translated into English and published in Jerusalem in 1966.

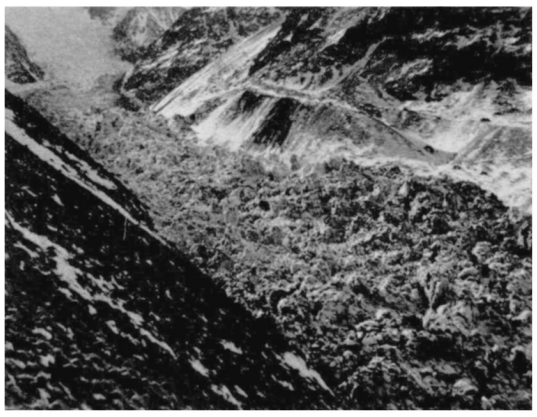
In 1963, after an extremely arid summer in Central Asia, the problem of artificial augmentation of river run-off for the irrigation of cotton fields became crucial. With a view to its solution the Department of Glaciology initiated detailed research on the artificial increase of glacier melting by surface dusting. This research included theoretical computations, laboratory experiments and experimental field studies on the glaciers of Central Asia. Results showed the method to be quite promising but larger-scale field tests are still needed.

In 1963 the whole country became aware of an abrupt, nearly 2 km, advance of the Medvezhiy Glacier in the Pamirs. A special expedition was organized within the Department which has worked in this region every year since then. The expedition took detailed geodetic and glaciological observations enabling prediction of the next surge well in advance:

Medvezhiy Glacier, Pamirs

this is believed to be the first precise and successful forecast of a glacier surge. Local authorities in the Vanch River basin were warned about the hazard and were able to take protective measures in time and avoid casualties; destruction was minimal.

In the winter of 1969-70 the small corrie-valley Kolka Glacier, on the northern slope of Kazbek Mt. in the Caucasus, advanced nearly 4 km. The glacier is only 30 km from Ordzhenikidze,the capital of the local republic.



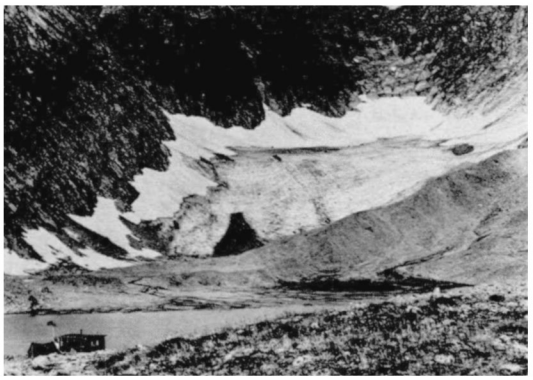
Kolka Glacier, Caucasus

The Department established an expedition which surveyed the behaviour of this glacier for three years. In the first summer it provided ten year forecasts of the possible consequences of melting and water outburst from the advanced tongue of the glacier.

Long-term observations of the Medvezhiy and Kolka glaciers resulted in the identification of a special class of surging glacier and revealed the possibilies of predicting their advances and subsequent melting of stagnant ice, explaining their mechanics and developing estimates of water-ice floods accompanying surges. These results have been summarized in two monographs now in press: "Surging glaciers" by L.D. Dolgushin and G.B. Osipova and "Results of studies on the surging Kolka Glacier" by K.P. Rototayev, A.N. Krenke and V.G. Khodakov.

In 1965 the USSR, like many other countries, began its International Hydrological Decade (IHD) program. The glaciological part included three projects: investigations of heat-, ice- and water-balance on selected mountain-glacier basins, observations of glacier variations and compilation of the glacier inventory of the USSR. All three projects were headed by the Department of Glaciology which investigated two of the seven mountain-glacier basins: the Bol'shaya Khadata River basin in the Polar Urals and the Marukh Glacier basin in the western Caucasus. Data from the first 5 years (1965-1969) have already been published and the balance (1970-1974) will go to press this year. In 1983 two monographs will be completed dealing with these basins; part of a 7 book series on the scientific results from the mountain-glacier basins during the IHD being published in Leningrad.

A standardized program of long-term observations of glacier variations (1973) was worked out in the Department and is now obligatory for such observations throughout the USSR. Glacier variation surveys are divided into three classes depending on the nature of the problem and the complexity of observation. The Department undertakes first-class observations on the Obruchev Glacier, Polar Urals, second-class on the Marukh and Medvezhiy glaciers, and third-class on about 10 glaciers in the Polar Urals and Pamirs. Those on the Obruchev Glacier were most fruitful and enabled detailed study of the mechanism of induced glacier variations and the introduction of some new concepts in dynamic glaciology, particularly the "isochronous surface" and the "kinematic equilibrium line".



Obruchev Glacier, Polar Urals

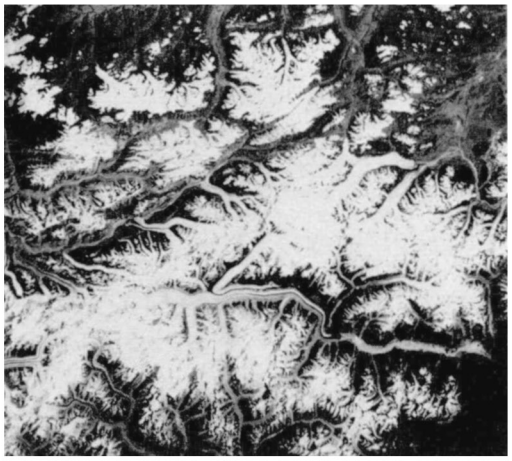
From 1965 to 1980 the Department directed the Glacier Inventory of the USSR, which is now complete. The series comprises 108 parts and is used throughout the Soviet Union for scientific and applied research. Most of the issues covering the Pamirian territory were compiled in the Department and it was with this in mind that a special expedition worked there from 1969-1974 undertaking unique studies: helicopter landings in accumulation basins at 3800-4600 m a.s.l. with semi-stationary investigations, snow surveys and pit studies.

Helicopter landing in the accumulation area of a Pamirian glacier

This vast program permitted evaluation of temporal and spatial variations in the snow cover and their climatic and hydrological characteristics, formulation of the water-ice balance equation of glacierized basins and analysis of its constituents, investigation of internal nourishment of glaciers and the acquisition of all necessary data for computing and predicting glacier run-off.

All these achievements were summarized in monographs by V.M. Kotlyakov "Snow cover of the Earth and glaciers" (1968), by V.G. Khodakov "Water-ice balance in the regions of present-day and former glaciation of the USSR" (1978) and by A.N. Krenke "Climatic conditions of the existence of glaciers in the USSR" (to be published in 1982).

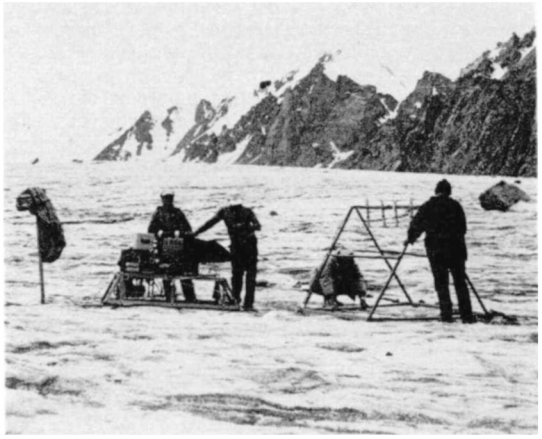
In the 1970's, promoting the ideas of A.I. Voeykov and H. Ahlmann, the Department developed glaciological methods for computing detailed fields of precipitation and run-off in the alpine and polar glacierized zones. These properties may be obtained either annually for the whole surface from data on seasonal displacements of the snow-line ("thermal development"), or over the surface of the "chionosphere" (the altitude of the equilibrium line) for a number of years or as an averaged total over a long-term from the glacier inventory data. This method proves most fruitful when combined with space observations. In the late 1970's an observational programme was carried out successfully by two pairs of astronauts on board the Salyut-6 station.



East Karakorum, near the Siachen Glacier, from Salyut-6, 13 September 1978

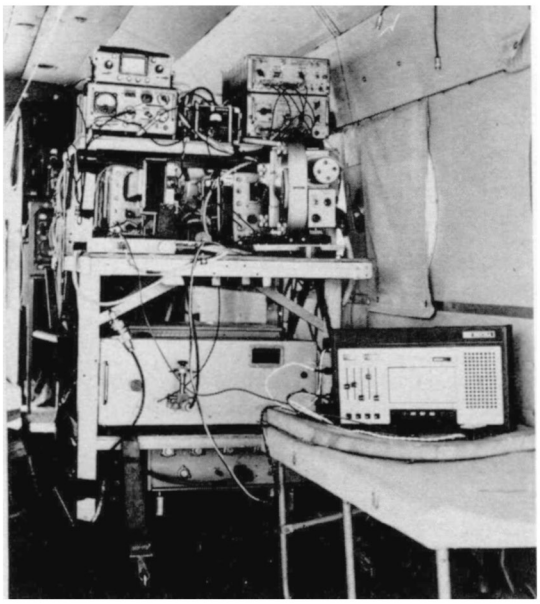
Much of the Departmental effort is concentrated on the development of geophysical and isotope-geochemical methods and techniques for glacier studies. Portable equipment for drilling deep boreholes in ice sheets using an alcoholic solution has been made. Continuous cores have recently been obtained from the Antarctic and Spitsbergen. On the Ross Ice Shelf, following successful penetration, a group of scientists under I.A. Zotikov managed to install ultrasonic equipment under it for studies of the melting-freezing processes at the ice-water interface. Very encouraging results have already been obtained. Those on the thermophysical investigations have been reported in two monographs by I.A. Zotikov "Thermal regime of the East Antarctic Ice Sheet" (1977) and "Thermal physics of ice sheets" (to be published in 1982).

In the mid-70's the thickness and internal structure of temperate glaciers was determined using equipment and methods developed by the Department.



Radio-echo sounding glaciers in Tien-Shan

The application was also successful in Spitsbergen where a long-term expedition had been working. Results of the first years' work were published in the collection "Glaciers of Franz Josef Land (Svalbard)" (1975) and a second monograph, containing mainly the results of the geophysical and geochemical studies, is close to completion.



RLS-620 radio-echo sounding equipment in MI-8 helicopter

Every year the Department of Glaciology participates in the work of the Soviet Antarc-

tic Expedition, mainly under the International Antarctic Glaciological Project (IAGP). The regime of the ice sheet along the Mirny--Vostok and Pionerskaya-Dome C profiles is studied. Special attention has been paid to deep drilling and core studies. Interpretation of the oxygen isotope profile from the 1000 m Vostok borehole is well known. Now the section to 1500 m is being analyzed. The advances made in the area of isotope and geochemical methods in glaciology by the Department and elsewhere in the world are presented in "Isotope and geochemical glaciology" by V.M. Kotlyakov and F.G. Gordienko, now in press.

Paleoglaciological research is also a major activity. The concept of the glacierization of continental shelves has been developed together with a geophysical classification of past ice covers permitting a glaciological interpretation of some facts presently used by oceanographers to counter the glaciation theory. Results of these studies are summarized in the monograph "Ice sheets of the continental shelves"by M.G. Grosswald (in press).

Considerable effort is also being directed to the processes of moraine formation and the history of former glaciations by applying a variety of analytical methods: morainic lithology, dendrochronology, etc. This led to a reinterpretation of the Caucasian glaciation during the Holocene and suggested a major role for exaration in the formation of glacial moraines.

Investigations of applied problems in glaciology are of great importance. The Department has developed and tested methods for the destruction of floating ice and for an efficient spray-cone (torch) method of ice freezing as well as methods for the research and mapping of natural glaciological characteristics, including all types of snow-ice processes and phenomena. Achievements in engineering glaciology are being documented for a monograph to be written in about two years.

Since 1976, the Department of Glaciology has been directing the preparation of the World Atlas of Snow and Ice Resources. The programme and compilation instructions for different maps have been worked out. A number of indirect methods for computing glacioclimatic parameters in the alpine zone have been developed so that, for the first time, thermal conditions, precipitation, snow cover and avalanches, glacier regimes and run-off over whole glacierized regions, such as the Caucasus, Pamirs, Tien-Shan, Alps, Alaska, etc., can be mapped. Compilation is expected to be completed by 1983-1984 at which time the Atlas will go to press.

As the leading glaciological institute in the Soviet Union, the Department convenes annual autumn all-union workshops in the vicinity of Moscow on problems of scientific research and the management of snow in the Soviet Union. These workshops usually draw 150-180 leading glaciologists from across the country. The Department also assists in the organization of quadrennial all-union glaciological symposia which take place in different cities (Alma-Ata, Tashkent, Tomsk, etc.) with about 300 participants. The 7th All-Union Symposium took place in 1980.

Since 1961 the Department of Glaciology, together with the Interdepartmental Geophysical Committee has published the well-known series "The Data of Glaciological Studies. Chronicle. Discussion". This is the only glaciological journal published in the USSR. During the past 20 years 40 issues of this series have been published. At present three issues are published annually.

The Department of Glaciology is the largest subdivision of the Institute of Geography of the USSR Academy of Sciences. Its staff numbers over 100 persons. Up until 1980 it maintained a manned research station in the Polar Urals. It continues permanent investigations in Antarctica, Spitsbergen, the Caucasus, the Pamirs and studies in the Tien-Shan and Kamchatka.

Glaciological field station in the Pamirs

Since 1968 the Department has been directed by Prof. V.M. Kotlyakov who succeeded Prof. G.A. Avsiuk in this post. It consists of four laboratories: 1)Snow and Ice Resources (headed by Dr N.N. Dreyer), 2) Glaciological Forecasts (headed by Dr A.N. Krenke), 3) Engineering Glaciology (headed by Dr V.G. Khodakov, 4) Polar Glaciology (headed by Dr B.I. Viturin) and the Editorial Group (headed by Mrs I.A. Loseva).

The main research effort of the Department in the current five years (up to 1985) is concentrated on four problems: compilation of the World Atlas of Snow and Ice Resources; development of the foundations for global and regional forecasts; studies of the interaction between glaciers, climate and the ocean, and investigations of polar glacierization. The glaciological studies of the Institute of Geography, of the USSR Academy of Sciences, and in the USSR in general, are providing new vistas for their future development.

V.M. Kotlyakov

INTERNATIONAL GLACIOLOGICAL SOCIETY

ANNUAL GENERAL MEETING 1982

MINUTES OF THE ANNUAL GENERAL MEETING OF THE INTERNATIONAL GLACIOLOGICAL SOCIETY

26 AUGUST in the Sheraton North Country Inn, West Lebanon, New Hampshire, U.S.A.

The President, Dr C.W.M. Swithinbank, was in the Chair. 65 members from 14 countries were present.

1. The Minutes of the 1981 Annual General Meeting, published in ICE No.67, 3rd Issue 1981, p.13-16, were approved and signed by the Chairman.

2. The President gave his report for 1981-82: The most important service rendered by the Society to its membership is the continuing publication of good quality original research results. The **Journal of Glaciology** has traditionally served as the main vehicle for the normal flow of contributions within the very broad field defined as "any aspects of snow and ice study". Symposium volumes have been increasing in size, however, ever since the Society began organizing or co-sponsoring major meetings on an annual basis. Indeed the publishing output from symposia has exceeded the routine output in every year since 1977 and it continues to increase. This seems to suggest a shift of emphasis by some authors away from the traditional journal article and towards the more focussed product of symposia. Meetings, moreover, bring the added advantage of personal contact with other glaciologists.

The **Journal of Glaciology** continues to flourish, last year's output totalling 528 pages. It is widely recognized that the very high standard of editing of papers is due above all to the time and skill devoted to it by John Glen and his team which includes Ray Adie, Doris Johnson, and David Homer. Refereeing and editing are vital but often thankless tasks. For understandable reasons, I suppose, it is more often the non-English speaking author who warms the heart of an English language editor by expressing gratitude for the improvements made to his writing. Many English-speaking authors fail even to notice how much better their paper reads after editing than it did before.

But the **Journal of Glaciology** faces serious problems due to rising costs. The principal cost which has recently overtaken the income required to meet it is that of printing. We changed printers last year in an effort to make savings without any obvious sacrifice of quality, but the savings have proved insufficient. Your Council has asked the Society's Printing Committee as a matter of urgency to look into the costs of publishing the **Journal of Glaciology** and to recommend substantial changes which would bring a solution to the problem of costs. Meanwhile, we have to clear a cumulative deficit of about £7000 which will be with us until the proposed changes can be brought into effect. I would like to appeal to all corporations who benefit from the Society's activities to consider making a one-time donation to help us over this difficult period.

You must know that our problems are far from being unique. The majority of small learned societies are facing similar difficulties due to the rising cost of traditional methods of journal printing. New technology, however, is very rapidly evolving to the point where electronic methods should yield a pleasing and easily readable product at a price we can afford.

We have certainly not yet reached that goal, but the Society's symposium series **Annals of Glaciology** has been experimenting with in-house preparation of papers on our own word processor. **Annals of Glaciology** volume 3, the proceedings of the Third International Symposium on Antarctic Glaciology, held at The Ohio State University, Columbus, Ohio, 7-12 September 1981, was printed by photo-lithography from copy prepared in the Society's office. This volume alone contains more words than 3 normal issues of the **Journal of Glaciology** and more than volumes 1 and 2 of the new series put together. It is no mean achievement that it was published in June 1982, nine months after the symposium was held. For this we must thank firstly the House Editor Ailsa Macqueen, who did the copy editing and brought together the efforts of the scientific editors, proof readers and printer. The Editorial Board and the Associate Editors, drawn from eight different countries, all played a vital part in maintaining the scientific standard that we have sought for the series.

Three issues of ICE, the Society's news bulletin, were published, and for that we must thank Simon Ommanney, the Editor, and all those who so diligently report on glaciological activities and events from around the world. ICE also records the meetings of our branches. The British, Nordic, North-East

North American, and Western Alpine branches all met in 1981 and three of them are to meet again in 1982.

The Society organizes its own symposia, co-sponsors glaciological symposia at the request of other bodies, and welcomes approaches from them to publish works on any aspect of snow and ice research. When we agree to publish in the **Annals of Glaciology** works by other groups, we apply the same conditions as we do to our own symposia: that papers are received by a stated deadline and are then subjected to the Society's standard refereeing and editing procedure. In addition, full grant support is requested so that the Society shall not suffer any financial loss. Judged by the proposals being received, our conditions are widely respected. We meet on the occasion of the Second Symposium on Applied Glaciology, attended by 150 glaciologists from 14 different countries. The continuing evolution of glaciology away from its earlier emphasis on glacierology, the study of glaciers, towards the study of snow and ice in all its forms, is shown by the fact that 7 of those 14 countries have no glaciers at all. But all of them have snow and ice.

For 1983 we are organizing a Symposium on Ice and Climate Modelling to be held at Northwestern University, Evanston, Illinois, USA, 27 June to 1 July. The meeting will be co-sponsored by the American Meteorological Society. The first circular was published in December 1981 and the second in May 1982.

For 1984 we are organizing a Symposium on Snow and Ice Processes at the Earth's Surface, to be held in Sapporo, Japan, 2-7 September. The meeting will be co-sponsored by the Japanese Society for Snow and Ice, and will be followed by a study tour of northwest China. The first circular was published in May 1982.

For 1985 we have a new proposal to be put before Council at its next meeting. For 1986 we are organizing a Second Symposium on Remote Sensing in Glaciology, to be held in Cambridge, England, 8-12 September. At this symposium the Society will be celebrating its 50th anniversary.

Whilst plans for symposia and symposium publications offer good grounds for optimism about the future, the Society's membership figures are giving cause for concern. Societies of this kind depend on loyalty from members for their survival, and we must do all we can to maintain and if possible to increase the membership. Numbers fell in 1981 and have fallen again in 1982. Library sales of the **Journal of Glaciology** have also fallen. Both trends are no doubt due in part to the current world-wide recession, but to some extent they reflect the fact that the **Journal of Glaciology** has failed to attract a sufficient number of papers from some of the rapidly developing branches of glaciology arising from the increasing penetration of industry into polar and high mountain environments. Your Council and the Printing Committee intend to pursue these problems in the best interests of the Society as a whole.

Despite pressure on the Society's budget, we have decided to hold dues for 1983 at £20 for members on the grounds that family budgets are also under pressure. At this price the **Journal of Glaciology** represents exceptionally good value for money. Indeed there are journals with a much larger circulation that, word for word, charge a lot more than we do. But value apart, we need members and must appeal for the continuing loyalty of all who support the Society's aims.

The Treasurer's report and the accounts for 1981 both show that we are sailing too close to the wind. Your Council has been rather preoccupied with seeking solutions both to the problem of cash flow and also to our unhealthy balance sheet. These efforts will continue and we shall not be afraid to take whatever action is necessary. We are looking at all aspects of the Society's operations and are keeping a careful check on office costs. Indeed the actual costs of administration have been brought down in real terms since the last accounting period.

The Cambridge office remains in the capable hands of Hilda Richardson assisted by Pat Lander. History will some day record how much we owe to the Secretary General, who more than anyone else has brought about the steady growth in the Society's activities since she took office. Through contacts in many lands, she has led glaciologists to understand that they belong to a family separated by oceans but united by interests held in common. Mary Parker joined the staff in April as part-time operator of the office's word processor. She is rapidly mastering the complexities of the machine and expects to keep up with the keying-in of **Annals of Glaciology** papers as fast as they come in from the editors. In addition, the Society's address list is now held on the word processor, which also prints out mailing labels. As a result, these tasks now take half the staff time that they did before. Spare time on the word processor is being used by associated groups who pay the full economic cost.

Gordon Robin retires at the end of September after serving for 24 years as Director of the Scott Polar Research Institute. Throughout this time he has allowed our main office to remain in the Institute at no cost to the Society. This has been of incalculable benefit both intellectually and financially and I would like to take this opportunity to put on

record our heartfelt gratitude. Many glaciologist, I believe, have found that the close ties between the Society and the Institute have made visits to Cambridge particularly rewarding. At least this must in part explain the welcome stream of members, often from quite distant countries, who visit the office at all times of the year.

I can now bring my report to a close with a happy announcement. Your Council, acting on a recommendation of the Awards Committee, has unanimously decided to award two Seligman Crystals in 1983: to Dr William O. Field and to Dr Johannes Weertman. Both crystals will be presented at the Symposium on Ice and Climate Modelling to be held at Northwestern University in Evanston, 27 June - 1 July 1983. You may wonder how, in the light of the financial problems that we have spoken of, the Society can afford one Seligman Crystal, let alone two. Let me reassure you that no part of your dues goes towards the provision of Seligman Crystals. They are separately paid for with income derived from a fund held for the purpose. You may also wonder whether, in spite of the merits of these worthy people, the award of two crystals in one year may risk establishing an undesirable precedent. The answer is no: Seligman Crystals are awarded on merit alone as and when the Council sees fit. We have awarded two in one year before (in 1972), and we have allowed intervals of up to 4 years to pass without awarding any. We intend to continue in the same unsystematic way, making the award always an occasion for surprise and joy, particularly we hope for the recipient.

The decision to reward Bill Field in this way was based principally on his pioneering work on the variations of Alaskan glaciers, his recognition and description of glacier surges, his cataloging of the glaciers of the world, his leadership in the development of US glaciological programs in a world-wide context, and his influence in bringing many others into glaciology in the days before US glaciology gained its own momentum. Hans Weertman's crystal is to be awarded principally because of his contributions to the study of ice shelves, glacier surges, dislocation creep mechanisms, quantitative theories of glacier sliding, and the reaction of ice sheets to climatic change.

We look forward with pleasure to seeing as many of you as possible at the Evanston symposium next summer. The subject of the meeting is timely and important.

3. The Treasurer, Dr J.A. Heap, submitted a report which was read by the President:

"As you will see from the audited Accounts for 1981 there was a surplus of £6,581 in 1980 and a deficit of £334 in 1981. Foremost among the reasons for this change for the worse in the Society's fortunes was rising costs and a fall in membership of almost 200 (one-fifth) following the rise in the annual subscription from £15 to £20 in 1981.

You will recall that I closed my annual report to you in 1980 by making three recommendations; that we should:

a) not raise the subscription to members for 1982;
b) continue to seek savings from the printing costs of the **Journal**;
c) draw to the attention of all members the need to recruit more members (including a drive to find our 'lost sheep').

On the basis of budget estimates for 1982 and 1983 and the audited accounts for 1981 the Secretary General has concluded that the Society is likely to have run up a total deficit of almost £7000 by the end of 1983 on the assumption that the library subscription is raised to £50 after two years at £45, that there is no increase in membership or in membership subscriptions and that no savings have been made in the printing costs of the **Journal**. In a letter dated 12 July 1982 to the Secretary General the Society's Auditors said that had it not been for the "skillful management of cash flow ... the Society would have had a very serious cash crisis" during 1981. In view of this warning we must take steps to avoid the Society running further into deficit after the end of 1983.

I have considered whether a solution might lie in raising the subscription in 1983 but I have concluded that in view of the reduction of membership following the last increase and as long as any other solutions are available, it would be imprudent of me to recommend such a course.

I consider that we should look for the greatest possible savings in printing costs of the **Journal of Glaciology** through changes in format, appearance and typographical quality. We should also seek to increase the circulation of the **Journal**. Two important results of cutting expenditure on printing would be a relaxation of the present onerous rules imposed on the Editors restricting the number of pages printed, and an increased speed of publication. Such changes should take effect at the beginning of 1984."

The Secretary General presented the accounts for 1981 on behalf of the Treasurer. There was a comment on the level of page charges for the **Journal of Glaciology** (£40 for a page of ca. 800 words), which was felt to be too high, and on the long delays in publication of articles in the **Journal**. Some members expressed support for the Council's decision, as announced by the President, to make changes in the method of printing the **Journal** in

order to reduce expenditure, as recommended by the Treasurer and the Auditors in their reports. A.J. Gow proposed the adoption of the accounts, this was seconded by R.P. Goldthwait and carried unanimously.

4. Election of Auditors for the 1982 accounts. A. Kovacs proposed and E. Pounder seconded that Messrs. Peters, Elworthy and Moore of Cambridge be elected auditors for the 1982 accounts. This was carried unanimously.

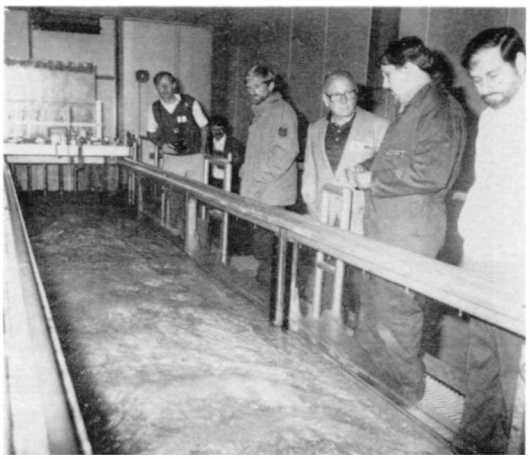
5. Elections to the Council 1981-84: After circulation to all members of the Society of the Council's suggested list of nominees, no further nominations had been received. The following people were therefore elected unanimously:

President	C.W.M. Swithinbank
Vice President	K. Kusunoki
Elective Members (4)	W. Ambach O. Reinwarth B. Stauffer A. Weidick

The President thanked the retiring Council members for their years of service: C.R. Bentley, H. Kohnen and I. Whillans.

SECOND SYMPOSIUM ON APPLIED GLACIOLOGY
23-27August1982, West Lebanon, New Hampshire, U.S.A.

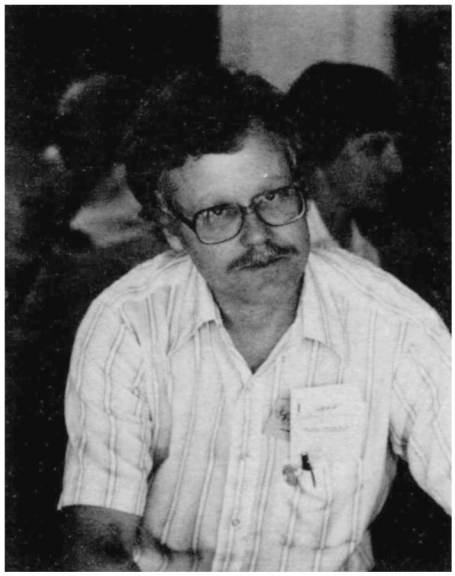
The Second Symposium on Applied Glaciology, hosted by the US Army Cold Regions Research and Engineering Laboratory, was held at the Sheraton North Country Inn, West Lebanon, New Hampshire from 23-27 August 1982. The meeting was sponsored by the International Glaciological Society and co-sponsored by the American Geophysical Union and the American Meteorological Society. Six years had elapsed between this meeting and the first symposium held at Cambridge,England, in September 1976. Thanks largely to the diligence of Ben Yamashita of the local organizing committee and Dave Langlois of CRREL, together with help from the headquarters staff from Cambridge, the major organizational and technical aspects of the symposium were carried through to a very successful conclusion. In addition to the technical program, participants also enjoyed a number of social events, including a visit to CRREL, followed by a traditional New England Clambake at a local ski resort.



Visit to CRREL: Ice Engineering Facility

The symposium attracted a total of 150 registered participants from 16 different countries. Response to the meeting was such that concurrent sessions on Sea Ice and Glaciers were needed to deal with the excellent array of papers received. The final count of papers was 65, presented in 11 separate sessions with chairmen as follows:

Snow (C.W.M. Swithinbank and L.W. Gold); Floating Ice (W.F. Weeks); Frazil-Ice Mechanics-Ground Ice (M.F.Meier); Avalanches (R.L. Brown); Sea Ice (P. Schwerdtfeger and K. Kusunoki); Glaciers (H. Röthlisberger); Accretion (K.Lied); and Icebergs (J. Schwarz). The proceedings consisting of about 40 edited articles will be published as Volume 4 of the Annals of Glaciology with Dr S.C. Colbeck as the Chief Editor.



Sam Colbeck, Chief Scientific Editor

On the evening of 24 August participants gathered to honor Dr Marcel de Quervain on the presentation of the Seligman Crystal to him by Dr Charles Swithinbank, President of the International Glaciological Society. Following the award of the Crystal Dr de Quervain treated the audience to a delightfully invigorating lecture on some specific aspects of his research in snow mechanics over the past 40 years. In attendance were a previous recipient of the Seligman Crystal, Mr Lyle Hansen, and one of the two newly announced recipients, Dr William O. Field. Both Dr Field and the second recipient, Dr Johannes Weertman, will be presented with their crystals at the Symposium on Ice and Climate Modelling in June 1983.

A.J. Gow

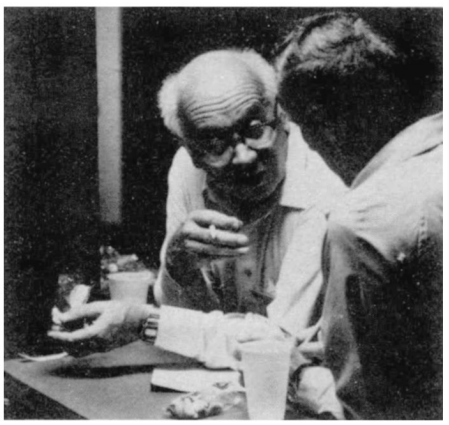
Bill Field

Walter Ambach: a hard choice

Mark Meier is obviously happy with his

CLAM BAKE

Hilda Richardson, our Secretary General



Andrew Assur taking time for more discussion

GLACIOLOGICAL DIARY

1983

20-22 June
Symposium on the Mechanics of Rocks, Soils, and Ice, ASME Applied Mechanics, Bioengineering and Fluids Engineering Division Joint Meeting. Houston, Texas, U.S.A. (S. Nemat-Nasser, Department of Civil Engineering, Northwestern University, Evanston, Illinois 60201, U.S.A.)

27 June - 1 July
Symposium on Ice and Climate Modelling. Northwestern University, Evanston, Illinois, USA. (Secretary General, International Glaciological Society, Lensfield Road, Cambridge CB2 1ER, UK)

18-22 July
Fourth International Conference on Permafrost. University of Alaska, Fairbanks, Alaska, U.S.A. (Louis de Goes, Executive Secretary, Polar Research Board, National Academy of Sciences, 2101 Constitution Avenue NW, Washington D.C. 20418, U.S.A.)

15-27 August
18th General Assembly of the IUGG. Hamburg, Federal Republic of Germany. (Dr J.C.Rodda, Secretary General IAHS, Water Data Unit, Reading Bridge House, Reading, RG1 8PS, U.K.)

16-17 August
Symposium on Polar Meteorology and Climatology, 18th General Assembly of the IUGG Hamburg, Federal Republic of Germany. (Dr G.E. Weller, Geophysical Institute, University of Alaska, Fairbanks, Alaska 99701 or Dr M. Kühn, Institut für Meteorologie und Geophysik, Schöpfstrasse 41, A-6020 Innsbruck, Austria)

18-19 August
Symposium on Sea Ice Margins, 18th General Assembly of the IUGG. Hamburg, Federal Republic of Germany. (Dr R.D. Muench, Science Applications Inc., 13400B Northrup Way, Suite 36, Bellevue, Washington 98005, U.S.A.)

18 August
Symposium on Atmospheric Ice Crystals and Haze in Polar Regions,18th General Assembly of the IUGG. Hamburg, Federal Republic of Germany. (Dr M. Kühn, Institut für Meteorologie und Geophysik, Schöpfstrasse 41, A-6020 Innsbruck, Austria)

25 August
Workshop on Glacier Mass Balance and Runoff, 18th General Assembly of the IUGG. Hamburg, Federal Republic of Germany. (Dr V.M. Kotlyakov, Institute of Geography, USSR Academy of Sciences, Staromonetny Street 29, Moscow 109017, USSR or Dr G.J. Young, Inland Waters Directorate, Environment Canada, Ottawa, Ontario, K1A 0E7, Canada)

26 August
Symposium on the Application of Stable Isotopes to Problems of the Atmosphere, Cryosphere and Ocean. Hamburg, Federal Republic of Germany. (Dr D. Ehhalt, Institut für Atmosphärische Chemie, Postfach 1913, D-5170 Jülich, F.R.G. or Dr L. Merlivat, Département de Physico-Chimie, Centre d'Etudes Nucléaires de Saclay, F-91191 Gif-sur-Yvette, Cédex, France)

26 August
Workshop on Large-scale Snow Studies, 18th General Assembly of the IUGG. Hamburg, Federal Republic of Germany. (Dr A. Rango, Hydrological Sciences Branch, Code 924, Goddard Space Flight Center, Greenbelt, Maryland 20771, USA)

5-9 September
XXth IAHR Congress. Moscow, U.S.S.R. (Organizing Committee, Institute "Hydroproject", Volokolamskoe Chaussée 2, Moscow A-80, 125812, U.S.S.R.)

12-16 September
International Symposium on Isotope Hydrology in Water Resources Development. Vienna, Austria. International Atomic Energy Agency, P.O. Box 100, A-1400 Vienna, Austria)

18-23 September
European Mechanics Colloquium on Mechanics of Glaciers. Interlaken, Switzerland. (Dr K.Hutter, Versuchsanstalt für Wasserbau, Hydrologie und Glaziologie, ETH - Zürich, CH-8092 Zürich, Switzerland)

28 September - 1 October
34th Alaska Science Conference. Whitehorse, Yukon, Canada. (Art Pearson, Box 4580, Whitehorse, Yukon, Y1A 2R8)

4-7 October
13th International Polar Meeting, German Society of Polar Research. Bamberg, Germany. (Dr Heinz Miller, Institut für Allgemeine und Angewandte Geophysik, Theresienstrasse 41, D-8000 München 2, Germany)

5-8 October
10th Annual meeting of the German Geomorphological Working Group. Berlin, Germany. (Prof. Dr G. Stäblein, Geomorphologisches Laboratorium, Altensteinstrasse 19, 1000 Berlin 33, Germany)

1984

12-16 February
3rd International Symposium on Offshore Mechanics and Arctic Engineering. New Orleans, Louisiana, U.S.A. (Dr D.S. Sodhi, CRREL, 72 Lyme Road, Hanover, New Hampshire 03755, U.S.A.)

18-23 August
Snow and Ice Chemistry and the Atmosphere. Trent University, Peterborough, Ontario, Canada. (Dr R.M. Koerner, Polar Continental Shelf Project, Department of Energy Mines and Resources, 880 Wellington Street, Ottawa, Ontario, K1A 0E4, Canada)

27-31 August
25th International Geographical Congress. Paris, France. (Comité d'organisation du 25e Congrès International de Géographie Paris-Alpes 1984, 19 rue Isidore Pierre, 14000 Caen, France)

2-7 September
Symposium on Snow and Ice Processes at the Earth's Surface. Tokyo and Sapporo, Japan. (Secretary General, International Glaciological Society, Lensfield Road, Cambridge CB2 1ER, U.K.)

1986

7-12 September
Symposium on Remote Sensing in Glaciology, 50th Anniversary of the International Glaciological Society. Cambridge, England. (Secretary General, International Glaciological Society, Lensfield Road, Cambridge CB2 1ER, UK)

NEWS

RECENT DEATHS

It is with deep sadness that we note the recent death of Sigurdur Thorarinsson one of the Society's Honorary Members and long-time National Correspondent for Iceland.

NEW PUBLICATIONS

The "Workshop on Antarctic Glaciology and Meteorites" compiled by Colin Bull and Michael Lipschutz (LPI Tech. Rept. 82-03) containing the abstracts of the 19-21 April 1982 workshop held in Houston is available at a cost of $3.00 from Fran Waranius, Librarian, Lunar and Planetary Institute, 3303 NASA Road One, Houston, Texas 77058, U.S.A.

NEW MEMBERS

Adams, Edward E., CE & EM Dept, Montana State University, Bozeman, MT 59760, USA

Gubler, Hansueli, Eidg. Inst. für Schnee- und Lawinenforschung, Weissfluhjoch, 7260 Davos, Switzerland

Hanvey, Patricia, 5 Lisboy Road, Saul, Downpatrick, County Down, Northern Ireland, UK

Jarvis, Jack, Department of Geography, University of St. Andrews, St. Andrews, Fife KY16 9AL, U.K.

Johannesson, Tomas, Geophysics Program AK-50 Univ of Washington, Seattle, WA 98195, USA

Magnusson, Magnus Mar, Geophysics Program AK-50, University of Washington, Seattle, WA 98195, U.S.A.

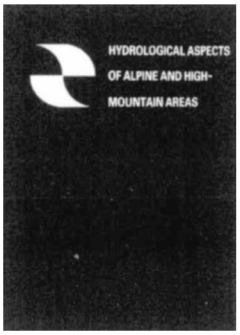
Mitsuhashi, Hiromi, Department of Architecture, Nihon University, Kanda-surugadai, 1-8-14 Chiyoda-ku, Tokyo 101, Japan

Potter, R.E., 240 Hillcrest Road, Berkely, CA 94705, U.S.A.

Raynaud, Dominique, Laboratoire de l'Environnement, 2 rue Très Cloîtres, 38031 Grenoble Cédex, France

Waythomas, Christopher E., INSTAAR, University of Colorado, Boulder, CO 80302, USA

Wojtaszek, Eliza I., School of Engineering, University of Alaska, Anchorage, 3221 Providence Drive, Anchorage, AK 99508, U.S.A.



Hydrological aspects of alpine and high-mountain areas

Edited by J.W. Glen
(Proceedings of the Exeter Symposium organized by the IAHS International Commission on Snow and Ice with the support of UNESCO)
350 + ix pages
price $30 (US)
IAHS Publ. 138 (Published 1982)

The alpine and high-mountain areas of the world play an extremely important and distinctive role in the hydrological processes of the planet, and in the regional hydrology of all continents. It is in alpine regions where meteorological, glaciological, periglacial and hydrological phenomena have most intimate and complex interaction and variability over short space and time scales, yet the results of these interactions have a profound effect on hydrological regions over much greater distances and longer time periods. However, because of this variability of interaction, and because of the characteristic irregularities of topography, surface and subsurface texture and contrasts of albedo, high-mountain areas present extremely difficult problems of hydrometeorological or energy exchange observation and sampling, and are poorly suited to the modelling or mathematical treatment of data. The 34 papers in this volume of proceedings examine the problems and recent progress in the study and interpretation of hydrological processes in alpine and high-mountain areas.

1 REGIONAL AND GENERAL ASPECTS OF ALPINE HYDROLOGY

Orographic variation of precipitation in a high-rise Himalayan basin *by A.K. Bagchi*; Maps of streamflow resources of some high-mountain areas in Asia and North America *by N.N. Dreyer, G.M. Nikolayeva & I.D. Tsigelnaya*; Characteristics of precipitation during the monsoon season in high-mountain areas of the Nepal Himalaya *by K. Higuchi, Y. Ageta, T. Yasunari & J. Inoue*; Investigations of the hydrological conditions of alpine regions by glaciological methods *by V.M. Kotlyakov & A.N. Krenke*; Hydrological aspects of the glacier regime in the north Tien Shan in the anomalously arid period of 1974–1978 *by K.G. Makarevich*; Hydrological relationships in a glacierized mountain basin *by G.J. Young*.

2 CHARACTERISTICS OF WATER STORAGE IN SNOW

Flow pattern of meltwater in mountain snow cover *by K. Higuchi & Y. Tanaka*; Water storage and drainage within the firn of a temperate glacier (Vernagtferner, Oetztal Alps, Austria) *by H. Oerter & H. Moser*; Snow accumulation derived from modified depletion curves of snow coverage *by A. Rango & J. Martinec*; Variations of the hydrological properties of alpine snow-cover stores *by R.G. Rau & A. Herrmann*.

3 CHARACTERISTICS OF WATER STORAGE AND DRAINAGE IN GLACIERS

A glacier discharge model based on results from field studies of energy balance, water storage and flow *by D. Baker, H. Escher-Vetter, H. Moser, H. Oerter & O. Reinwarth*; Water storage in an Alpine glacier *by D.N. Collins*; The importance of the structure of the glacier internal and external runoff system of channels and streams to glacier activity *by A.B. Kazanskiy*; Modelling runoff from a glacierized basin *by D. Lundquist*; A simplied model for estimating glacier ablation under a debris layer *by M. Nakawo & S. Takahashi*.

4 CHARACTERISTICS OF WATER STORAGE AND RELEASE BY SNOW

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