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101 YEARS OF INTERNATIONAL SNOW AND ICE RESEARCH

ABSTRACT: KUHN M., *101 years of international snow and ice research*. (IT ISSN 0391-9838, 1995).

The paper describes the development of international snow and ice research since the foundation of the Commission Internationale des Glaciers in 1894 and its role in world wide glaciological activities.

The Commission Internationale des Glaciers was followed in 1927 by the Glaciological Commission of the International Association of Scientific Hydrology, and in 1936 by a new International Commission on Snow. The two were amalgamated into a single International Commission on Snow and Ice (ICSI) in Oslo 1948.

ICSI is one of the commissions of IAHS which in turn belongs to the Union of Geodesy and Geophysics. It is a non-government organization that treats all aspects of snow and ice in regular symposia and workshops and gives guidance to glaciological research worldwide. It supports the World Glacier Monitoring Service and closely cooperates with the Water Division of UNESCO and with the Scientific Committee on Antarctic Research.

KEY WORDS: History of glaciology, Snow and ice research, International organizations.

RIASSUNTO: KUHN M., *101 anni di ricerca internazionale nivologica e glaciologica*. (IT ISSN 0391-9838, 1995).

Viene descritto lo sviluppo della ricerca internazionale nivologica e glaciologica fin dalla fondazione della Commission Internationale des Glaciers nel 1894 ed il suo ruolo nelle attività glaciologiche mondiali.

Alla Commission Internationale des Glaciers seguì nel 1927 la Glaciological Commission of the International Association of Scientific Hydrology e nel 1936 una nuova International Commission sulla neve. Le due commissioni vennero fuse nella International Commission on Snow and Ice (ICSI) a Oslo nel 1948. L'ICSI è una delle commissioni dell'IAHS che a sua volta fa parte della Union of Geodesy and Geophysics. È un'organizzazione non governativa che tratta tutti gli aspetti della nivologia e della glaciologia in periodici incontri e convegni e costituisce un riferimento per la ricerca glaciologica in tutto il mondo. Essa sostiene il World Glacier Monitoring Service e collabora strettamente con la Water Division dell'UNESCO e con il Scientific Committee on Antarctic Research.

TERMINI CHIAVE: Storia della Glaciologica, Ricerca nivologica e glaciologica, Organizzazioni internazionali.

EARLY HISTORY

The foundations of international cooperation in glaciology were laid at the 6th International Geological Congress in Zurich in 1894 when F.-A. FOREL and M. HALL constituted the *Commission Internationale des Glaciers* (CIG). The general advance of natural sciences in the 19th century, the development of alpinism and of expeditions to the high mountains in overseas and to the polar regions as well as the growing awareness of past ice ages that was gained from the observation of morphological traces and the rapid retreat of Alpine glaciers all contributed to an enhanced growth of scientific interest in and understanding of the glaciers of the world.

The first page of the first report of the newly founded Commission Internationale des Glaciers is reproduced in fig. 1. FOREL & PASQUIER (1895) summarized the aims of research at that time as follows: *We try to study the periodic variations in the size of glaciers, to recognize and distinguish periods of variation and to determine their dates, to establish the relations that may exist between various mountainous regions of our globe.*

This scope of international investigations called for a worldwide net of observations on a national basis. Only a year after the International Glacier Commission, the *Comitato Glaciologico Italiano* was founded as one of the first of such national committees. In the years that followed, the Comitato was represented at all of the international meetings dealing with snow and ice which progressed along two lines.

The next meeting of CIG took place in St. Petersburg in 1897, and the following was convened again by F.A. FOREL in Paris in 1900 and concentrated on glacier variations. In 1903 Sebastian FINSTERWALDER, who had formulated his concept of a stationary glacier in the preceding years, hosted the meeting in Vienna in order to discuss the phenomenon of kinematic waves. First Antarctic data were treated at the CIG meeting in Mexico in 1906, E. BRÜCKNER chaired the CIG meeting in Stockholm 1910,

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VARIATIONS PÉRIODIQUES DES GLACIERS

1^{er} RAPPORT, 1895,

rédigé au nom de la Commission internationale des glaciers

PAR

F.-A. FOREL
Professeur à Lausanne.

Léon DU PASQUIER
Professeur à Neuchâtel.

AVANT-PROPOS.

Dans notre *discours préliminaire*¹ nous avons précisé les grands traits du programme que s'est imposé la *Commission internationale des glaciers* au début de ses travaux. Nous cherchons à étudier les variations périodiques que présente la grandeur des glaciers, à reconnaître et à distinguer les périodes de variation et à en déterminer la date, à constater les rapports qui peuvent exister entre les phases de la période dans les diverses régions montagneuses des deux hémisphères de notre globe. Plus tard, à mesure que nos études se poursuivront, le programme se développera peut-être, se perfectionnera et abordera de nouvelles questions, s'il y a lieu.

Pour le moment la tâche immédiate de la Commission

¹ *Archives*, XXXIV, 209. Genève, 1895.

FIG. 1 - The first page of the first report of the Commission Internationale des Glaciers (FOREL & PASQUIER).

where periodic phenomena were the main topic. After a general retreat of Alpine glaciers that had lasted more than 50 years Ch. RABOT convened a meeting in Toronto that discussed the first cases of readvancing glaciers in 1913.

Beginning in 1899, there was a short series of International Conferences on Glaciers, the first being organized by RICHTER in Gletsch at the foot of Rhone Glacier. In 1901 RICHTER and FINSTERWALDER invited the glaciological community to Vent, a small Tyrolean village below Hintereisferner, one of the centers of glaciological activities from that time to the present. H.F. REID of Baltimore chaired the third international conference on glaciers in September 1905 (*Journal of Glaciology*, 1951). The fifteen members of that meeting, posed in front of Forno Hut near Maloja Pass in fig. 2, represented an international conference at that time while today we would call them rather an exclusive group of experts compared to the large attendance in recent glaciological meetings.

World War I and the economic and political problems of the following decades slowed down the pace of scientific investigations, expeditions and international exchange. At the General Assembly of the International Union of Geodesy and Geophysics in Madrid, 1924, the International Association of Scientific Hydrology (IASH) was founded and at a meeting in Prague in 1927 CIG was incorporated into IASH. Subsequent meetings took place in 1930 in Stockholm, 1933 in Lisbon where SOMIGLIANA presented his viscous glacier flow model, 1936 in Edinburgh where the International Commission on Snow was constituted.

International cooperation was curtailed again in the eve of World War II and the 1939 CIG meeting in Washington had little attendance from European scientists. Nevertheless it is noteworthy that here the decision was taken to merge the glacier commission with the snow commission. This was finally put into effect at the 1948 meeting in Oslo with the creation of the International Commission on Snow and Ice (ICSI) that persists unchanged to the present day.

Worldwide glaciology has benefitted from two efforts of international cooperation that had been initiated by IUGG with a broader scientific scope: the Second Polar Year 1932 and the International Geophysical Year (IGY) 1957/58. Both could rely on large numbers of observing stations and field parties, both were designed with an emphasis on polar, rather than alpine glaciology. Particularly the IGY meant a significant step ahead in our understanding of terrestrial and marine ice masses and set the stage for the period of drilling through and numerical modelling of glaciers of all sizes.

So impressive was the success of IGY glaciology that ICSI with support by the Water Division of UNESCO launched a program on «*Combined ice, water and energy balances*» in the frame of the International Hydrological Decade (IHD) 1964-74. It envisaged meridional and zonal chains of investigations along climatically diverse transects, and even though this goal was so ambitious that it has not completely been reached until now, it has greatly promoted glaciology as a hydrological science.

With the first Greenland and Antarctic ice cores extending the isotope history back into the ice age, however, glaciology's importance as a climatological science was growing. It peaked in the eighties when phantastic greenhouse prognoses scared laymen and scientists alike. The need for verification of these models with data on past climates spawned a series of deep drilling projects that have indeed promoted international cooperation and have contributed significantly to our present view of the climate system.

Climate forcing and dynamic response of glaciers call for longterm investigations and monitoring of snow and ice on a global scale. Under the auspices of ICSI, two important, global efforts have been institutionalized: The compilation and assemblage of data for a world inventory of perennial snow and ice masses and a service on the fluctuations of glaciers. Both of them have been merged into the present World Glacier Monitoring Service that is presented by W. HAEBERLI in this volume.



FIG. 2 - Members of the Third International Conference on Glaciers posed in front of Forno Hut near Maloja Pass, September 1905. Left to right, back row: A. BLÜMCKE (Nuremberg), F. MACHATSCHEK (Vienna), G. MERZBACHER (Munich), K.J.V. STEENSTRUP (Copenhagen), P.L. MIERCANTON (Lausanne). Front row: P. HARDER (Copenhagen), E. BRÜCKNER (Halle, Saxony), H. CRAMMER (Salzburg), S. FINSTERWALDER (Munich), A. HAMBERG (Stockholm), F.A. FOREL (MORGES), H.F. REID (Baltimore), F. WAHNSCHAFFE (Berlin), E.J. GARWOOD (London), F. PORRO (Genoa) (reproduced by permission of the International Glaciological Society).

PUBLICATIONS

Several reports on Alpine glaciers and textbooks on glaciology had been written in the 19th century (among them FORBES 1843, TYNDALL 1860, HEIM 1885, ZURCHER & MARGOLLE 1888, RICHTER 1888, HESS 1904), glaciological topics had been treated in the journals of alpine clubs and annual reports were being issued at the national level, but a true glaciological journal with international contributions was still missing a decade after the foundation of Commission Internationale des Glaciers.

In 1907 E. BRÜCKNER edited the first volume of *Zeitschrift für Gletscherkunde* with the subtitles *Annales de Glaciologie*, *Annals of Glaciology*, *Annali di Glaciologia*, *Organ of the International Glacier Commission* (see fig. 3). Olinto Marinelli of Florence was the Italian member in the editorial board. The first issue contained contributions by authors from ten countries, dealing with glaciers all over the world except Antarctica, and among other things reported on the work of the Commission Internationale des Glaciers, the reports being printed in the various languages of the contributors.

Glaciological literature and information continues to be presented in print and on internet at a growing pace. Among the journals the *Journal of Glaciology* from Vol. 1 No. 1 in 1947 to Vol. 41 No. 139 in 1995 has the widest distribution. *Zeitschrift für Gletscherkunde* that started in 1907 was discontinued after Vol. 28 (1942). It appeared

ZEITSCHRIFT FÜR GLETSCHERKUNDE,

FÜR EISZEITFORSCHUNG UND GESCHICHTE DES KLIMAS

ANNALES DE GLACIOLOGIE ANNALS OF GLACIOLOGY
ANNALI DI GLACIOLOGIA

Organ der Internationalen Gletschercommission

unter Mitwirkung von

S. Finsterwalder (München), F. A. Forel (Morges), J. Geikie (Edinburgh), W. Killian (Grenoble),
Olinto Marinelli (Florenz), F. Nansen (Kristiania), A. Penck (Berlin), F. Porro (La Piète),
Charles Rabot (Paris), H. F. Reid (Baltimore), F. Wahnschaffe (Berlin), A. Woeikof (St. Petersburg)

herausgegeben von

EDUARD BRÜCKNER
Professor an der Universität Wien

I. Band
1906/07

BERLIN
VERLAG VON GEBRÜDER BORNTRAEGER
SW 11 DESSAUERSTRASSE 29
1907

FIG. 3 - The frontspiece of the first issue of *Zeitschrift für Gletscherkunde*, 1907.

again in 1947 with Vol. 1 of *Zeitschrift für Gletscherkunde und Glazialgeologie* and has presently reached Vol. 31 (1995). Malcolm Mellor edited the first issue of *Cold Regions Science and Technology* in 1979 which is now at No. 23 (1995). Twenty one volumes of *Annals of Glaciology* with proceedings of IGS Symposia have appeared since 1980. The so called Red Book Series of IAHS Press is the longest of its kind: Its first glaciological issue was Edinburgh 1936, more than 30 have appeared since.

There have been excellent national publications like *Materialy Glyatsiologicheskikh Issledovaniy* (Data of Glaciological Studies) with No. 79 in 1995 or *Die Gletscher der Schweizer Alpen* from No. 1 in 1880 to No. 108 in 1992. It is sometimes difficult to tell if and when these national reports have expanded to the international level as the former *Bollettino* did when it became the present *Geografia Fisica e Dinamica Quaternaria*.

STRUCTURE AND TASKS OF ICSI

The organization of international glaciology has various modes of operation. The International Glaciological Society is the largest body with more than 1000 members. It issues the *Journal and Annals of Glaciology* and organizes or cosponsors several international meetings each year. Governments of member countries can contribute directly to some organizations as the Scientific Committee on Antarctic Research (SCAR) or the International Arctic Science Committee (IASC) both of which have working groups on glaciology whose members plan, organize and carry out basic and applied glaciological research. The International Council of Scientific Unions is the parent of a hierarchy of non-government scientific organisations. At subsequent levels follow the International Union of Geodesy and Geophysics and International Association of Hydrological Sciences (formerly «of Scientific Hydrology») of which ICSI is one commission.

The objectives and tasks of the International Commission on Snow and Ice are

- to promote the snow and ice aspects of the objectives of the Association or of the Union
- to initiate, facilitate or coordinate research investigation of snow and ice problems which require international cooperation
- to provide for discussion, comparison and publication of information and research results.

These objectives are met with working groups, workshops and conferences, and by giving guidance to the World Glacier Monitoring Service. The activities of ICSI are guided by a Bureau consisting of the following officers: a president; a past president or president elect; three vice-presidents; the heads of divisions & permanent service; a secretary.

The divisions cover the following scientific topics:

1. Seasonal snow cover & avalanches
2. Glaciers and ice sheets
3. River, lake and sea ice
4. Ice as a material

The divisions can establish working groups that deal with specific tasks for a period of four years and typically have 20 members. The present working groups are:

1. Snow and climate
2. Atmosphere-snow chemical exchange
3. Andean glaciology
4. Himalayan glaciology
5. Methods of mass balance measurements in various climates

ICSI has national correspondents in more than 30 countries. Other than the officers, working group members and national correspondents there is no individual membership. Appointment to a working group or nomination and election to an office is not according to countries nor to seniority, it is «free to anyone having performed research on snow and ice» according to ICSI's statutes.

On the occasion of the 100th anniversary of the Comitato Glaciologico Italiano ICSI congratulates the Italian glaciological community to its initiatives and achievements past and present in both alpine and polar glaciology and extends a cordial invitation to continued and prosperous international cooperation.

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