



INTRODUCTION



In gallery of glacier cave at tongue of Fall Glacier, Land Prints Karl Island, Spitsbergen, July 2003
Photo by I.Yu. Solovyanova

PRESENTATION OF VII SYMPOSIUM OF GLACKIPR

Dear Colleagues:

On behalf of International Commission «Glacier Caves and Karst in Polar Regions» (GLACKIPR), we have the pleasure to welcome all participants of this VII International Symposium . Our special gratitude to Dr. Bulat Mavlyudov, responsible of the organization of the present Symposium.

It is developed in the North part of Caucasus, in the Azau region (Kabardino-Balkarija), Russia. In this region are located some glaciers as: Garabashi, Azau, Shkhelda, Bashkara and Bezengi.

This Symposium marks the 16th anniversary of the creation of GLACKIPR, which took place in Budapest during the 10th International Congress of the UIS in August 1989.

The others Symposia organized by GLACKIPR are:

- 1st in Madrid (Spain), October 1990
- 2nd in Silesia (Poland) in February 1992
- 3rd in Chamonix (France) in November 1994
- 4th in Rudolfschütte (Austrian Alps) in September 1996
- 5th in Courmayeur (Italian Alps) in September 2000
- 6th in Ny-Ålesund (Svalbard) in September 2003

Waiting a great success,



Adolfo Eraso
President of GLACKIPR
GLACKIPR

Giovanni Badino
Secretary of

Glacial karst (**GK**) is widely spread on glaciers of different types and sizes in different regions of the world. **GK** has great value not only by itself but also plays an important role in life and evolution of glaciers. Under **GK** we understand a set of phenomena and processes, which result in formation of cavities in ice thickness, under and on ice surface. The essence of **GK** are internal drainage systems which are widely spread on glaciers of all types and thermal conditions. As drainage systems develop in glaciers they come into complex interaction, what inevitably has influence both on glaciers and on drainage systems. It is clear, that in different glaciers these interactions will have different features.

Internal glacier drainage systems as main part of **GK** have following functions: to carry a part of runoff from glacier surface inside the ice, to drive a part of heat from surface inside the ice, to create and remove overpressure in ice thickness, to create water reservoirs in ice thickness and under ice, to promote local change of ice physical properties, to create preconditions for accomplishing or prevention of glaciers surges, to promote accelerated destruction of dead and poorly moving ice masses. Sometimes glacier drainage systems serve also as basic agent of glaciers destruction. The last was probably important at destruction of Scandinavian and Lavrentian glacial sheets in the period of deglaciation.

Despite of such important role in life and evolution of glaciers **GK** yet did not become an object of steady studying. Besides, historically it has developed, that glacial caves as components of an internal drainage of glaciers are studied not by glaciologists, but by speleologists and karstologists. Despite of rich history of glaciology, which began to develop actively since 1960-ties, objects and results of its research are rarely used in glaciological research.

The first research of glacial caves started in the beginning of natural sciences development in the XVIII-XIX centuries and represented by names of well-known researchers: Bourrit (1783), Sasseur (1776), Agassiz (1840), Hopkins (1845), Forbes (1845), Désor, 1844, Stoppani, 1876, Bonney (1876), Russell (1893), Balch (1900), Tyndall (1904), etc. But in those days cave visitors went into caves mainly not to look for knowledge, but to satisfy their curiosity. And only in the end of XIX century researchers of glacial caves promoted topographical survey (Vallot, 1898). In the XIX century research of horizontal glacial caves had almost no need in special equipment, therefore

glaciologists frequently visited these caves. Researchers of vertical glacial caves (moulins) needed special climbing equipment – what hindered them in their explorations. It is a regret to see, that knowledge and scientific data received in very difficult conditions by speleologists remain practically not claimed in glaciology.

Thus glaciological research of internal drainage of glaciers was carried out basically at a theoretical level (Shreve, 1972, Rothlisberger, 1972, Nye, 1976, Golubev, 1976 and others).

Research of **GK** in the beginning stage was connected to names of scientists: Sieger (1895), Kruber (1915), Matthes (1928), Kalesnik (1935), Charlesworth (1957), Clayton (1964). Later **GK** studying has broken into different directions: research of superficial forms of **GK** (Pulina, 1984, Krüger, 1994), studying of glaciers covered with rock debris (Nakawo, 2000), glacial and near glacial lakes (Yamada, 1998, Sakai, 2000, 2001), studying of channels in thickness of glaciers (Halliday, Anderson, 1969, Pulina, Rehak, 1991, Schroeder, 1995).

The creation of an international group «Glacier caves and karst in polar regions» (**GLACKIPR**) as a division of the International Speleological Union helped to develop glaciology. Since 1991 the group carries out symposiums, prints proceedings and publishes monographies (Acts, 1995; Proceedings, 1991, 1992, 1998, 2002, 2003; Eraso A., Pulina M., 1992, 2001). Not only descriptions of newly explored glacial caves, but also results of research based on glaciology (speleogenesis, hydrochemistry, plastic deformation of ice, evolution of internal drainage systems of glaciers, theoretical generalization, models, historical researches, etc.) are published.

On the whole, studying of **GK** does not attract a lot of attention of researchers. Nevertheless, in the book by Benn D.I., Evans D.J.A. «Glaciers and glaciation» (1998) a small chapter is devoted to **GK**, and in 2000 an international symposium «Debris-covered glaciers» took place.

Despite of rather rich history of research in the scientific community there is no common representation what **GK** is. At present time there are different approaches to the concept of **GK**: 1) **GK** is developed in area of glacier from tongue up to area of development of median moraines (young stage of development) (Clayton, 1964); 2) **GK** develops only in glacier tongue on ice surface where moraine sediments melt through and dolines develop (Kalesnik, 1936; Krüger, 1994); 3) instead of **GK** a term «debris-covered glacier» is used, which is applied only to tongue parts of glaciers (Nakawo, Young, 1981); 4) the term **GK** is understood as area of glacier with moulins (Badino, 2002), i.e. glacier areas higher then covered by surface moraine; 5)

GK develops within the limits of all ablation zone (Pulina, Pereyma, Piasecki, 2002), what concerns mainly superficial forms.

Research of **GK** has big prospects. Development of problems of **GK** origin, formation and evolution gives a new tool of glacier-knowledge into researchers hands. Only knowing a structure of internal drainage systems in various glaciers it is possible to interpret reliably geophysical data (for example, the data received by georadars), to build authentic models of an internal drainage of glaciers (modern DIM models unfortunately are very far from reality as they do not take into account the specific structure of real internal drainage systems of glaciers), to build forecasting models of glacier-based catastrophic phenomena (surges, floods, burst of water from lakes, etc.), correctly to understand mechanisms of glacial surges, outbursts of glacier-dammed lakes and also to understand reactions of glaciers to short-term and long-term climate variations.

Internal drainage systems of glaciers are not only extraordinary dynamical but also capable to transfer external influences in thickness of glaciers in a short time. If there were no internal drainage systems of glaciers it would be impossible quickly to transfer external influences in thickness of ice.

One of the important tasks of the 7th International *GLACKIPR* symposium and this collection of articles was to bring modern achievements in glaciopedology and in adjacent scientific directions to wide scientific community. The second target of symposium was the discussion of questions connected to studying of permanent ice in caves. One can question, why these at first sight different scientific directions were put together within the framework of one symposium.

The matter is that despite of a considerable difference in research objects both these directions have much in common: cold accumulation in cavities, ice accumulation, cavities formation, sources of water inflow in a cavity etc. Thus research within the limits of one scientific direction may be useful at research in the other one, they will mutually enrich each other.

Represented to attention of readers this collection of articles is based on materials of the 7th International symposium «Glacier caves and glacial karst of high-mountain and polar regions» which was held on 5-11 September, 2005 in Azau, Prielbrusje region, Kabardino-

Balkarian republic, Russia. In addition to reports presented at the symposium this collection also includes articles of members of *GLACKIPR* commission and last version of the English-Russian dictionary of terms and expressions on hydrology of glaciers.

The publication of this collection of reports and the organization of a symposium would be impossible without active help of the chairman of organizing committee, the director of Institute of Geography of the Russian Academy of Science, academician V.M. Kotlyakov. Special gratitude is also expressed to Geographical faculty of the Moscow State University – to the dean, corresponding member N.S. Kasimov and to head of Elbrus educational and scientific base of Geographical faculty of the Moscow State University in Azau A.D. Olejnikov for the possibility to realize the symposium and accomodate in Azau, Prielbrusje, Kabardino-Balkarian republic. The work of symposium would also be impossible without active participation of members of organizing committee and assistants: I.Yu. Solovyanova, Yu.S. Kosorukov, Ya.N. Nikitin. B.R. Mavlyudov, I.Yu. Solovyanova, L.R. Il'yasova actively took part in editing and assembling of this book of reports. Translations of reports from Russian into English and correction of translated texts was made by A.Yu. Serov.

Bulat Mavlyudov