

ICE MEMORY: new drilling operations in Russia

May 20th / July 25th 2018

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Collecting ice cores from glaciers most at risk from climate change and storing them in Antarctica for future generations of scientists: that is the goal of **ICE MEMORY**, an international programme aimed at preserving the climate and environmental memory of glaciers. Following the two successful drillings in the *Col du Dôme* glacier in French Alps in August 2016 and on the Illimani glacier in Bolivia in June 2017, two further drilling expeditions will be conducted in Russia in May and June 2018.

May: drilling operation on Belukha glacier, Siberian Altai

From May 20th to June 16th, a drilling operation will take place on the Belukha glacier, coordinated by Margit Schwikowski, head of the Environmental Chemistry Laboratory and head of the Analytical Chemistry Group at the Paul Scherrer Institute in Switzerland.

The Belukha glacier is located on a saddle between the two summits of Belukha, the highest mountain in the Altai (4,506 m a.s.l.). The Altai mountain range is a remote area on the northwestern periphery of central Asia, at the border between east Kazakhstan, southwest Siberia, northwest China, and Mongolia. The region is of particular interest for paleo research because of its high continentality and its location on the boundary between Siberian forests and arid regions in central Asia.

Ice cores were already collected from Belukha glacier in 2001 and 2003, demonstrating that this is most probably the only site suitable for ice core studies in this region. Although ice temperatures were below -14°C, melt layers were observed in the upper part due to a recent strong increase of summer temperatures. To preserve this valuable environmental archive, there is an urgent need to collect further ice cores.

The drilling operation on Belukha glacier will start around May 20th. The equipment was shipped from Switzerland to Barnaul in Siberia and will be transported together with the drilling team by helicopter to the glacier. The main goal is to recover two new cores down to bedrock, each of ca.150m lengths using an electromechanical drill.



View of the Belukha Mountain from the North. The ice cores will be drilled in the glacier saddle located between the two summits.

The drilling team will spend about 20 days on the glacier. Ice cores weighing about 1.5 tonnes will be transported by helicopter to the nearest road and then in freezer trucks to the storage facility in Barnaul.

One ice core will be analysed for stable isotopes, major ions, trace elements, black carbon, and organic tracers to create a reference data base while the parallel ice core will join international repositories as part of **ICE MEMORY**.

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The drilling team consists of **Margit Schwikowski** (expedition leader), **Theo Jenk**, **Michael Sigl**, **Julika Stampfli** (Paul Scherrer Institute, Switzerland), **Martina Barandun** (University of Fribourg, Switzerland), **Reto Schild** (mountain guide, Switzerland), **Sergei Kopytin** and **Andrei Obukhov** (rescue Service of the Altai Republic) with support from Alexander Revtov, Pavel Chernyavsky (rescue Service of the Altai Republic), **Tatyana Papina** and **Stella Eyrikh** (Institute for Water and Environmental Problems, Barnaul) in Ak-kem basecamp.

This drilling is a joint project of the Institute for Water and Environmental Problems, Siberian Branch of the Russian Academy of Sciences (IWEP-RAS, Barnaul) and the Paul Scherrer Institute (PSI Villigen, Switzerland), financially supported by the Swiss National Science Foundation and the Swiss Polar Institute.



The Belukha North face from Ak-kem basecamp.

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June: drilling operation on Elbrus glacier, Caucasus

From June 10th to July 25th, a drilling operation will take place on Elbrus glacier, in Caucasus, coordinated by Vladimir Mikhailenko and Stanislav Kutuzov (Institute of Geography, Moscow).

Elbrus, the ice-covered Europe's largest volcanic massif (5,642 m), is located in Caucasus mountains at Southern Russia. Elbrus glacial system with the total glaciated area of about 115 km² contains more than 10% of the total ice volume in the Greater Caucasus. The Baksan, Kuban, and Malka Rivers runoff from the Elbrus glaciers irrigates agricultural lands on steppe plains of the North Caucasus.

Due to its altitude above 5,000 m above sea level, melting ceases completely. Elbrus is one of the few glaciers in Europe where the climate signal is preserved undisturbed. Results of the first ice core drilling operation in 2009 showed that ice cores from the Elbrus Mountain can provide unique information about several key aspects of the changing environment, air pollution and volcanic activity.

Ice core data can be used to reconstruct past conditions, not only in Caucasus but for a much broader region, including Western and Eastern Europe, Southern Russia and the Middle East. It is anticipated that



Southern slopes of Elbrus Mountain.

continues ice core record will cover more than 500 years. Furthermore, the rate of Elbrus's glacier reduction has increased significantly in recent decades. Therefore, there is an urgent need to preserve this valuable environmental archive.

For this drilling, the ice core drill already used at Mont-Blanc and Illimani will be implemented. 600 kg of equipment has been shipped between the IGE laboratory (*Institut des géosciences de l'environnement, Grenoble*) and Moscow. All this logistics and customs formalities were conducted by ULISSE (International Logistics Unit – Services and Support to Experiments, Annecy), the logistics unit of the CNRS.

Since the end of May, the team of 7 researchers will start to acclimatize to high altitude conditions with

the help of professional mountain guides. In June, equipment and personnel will be transported by helicopter to the drilling site at 5,100 m. The main goal is to drill glacier down to bedrock and to retrieve two 240 m long ice cores. Drilling will be accomplished using electromechanical drill and the whole operation will take about 25 days. Frozen ice cores of 3 tones weight will be transported first down to the nearest paved road by helicopter and in freezer trucks to the storage facility of the Institute of Geography (Russian Academy of Science, Moscow), where primary processing will be carried out.

One of the ice cores will be analysed by an international team of scientists at the IGE laboratory (CNRS/IRD/UGA/Grenoble INP) in 2019, in order to identify chemical tracers available with current technologies and to create an open database accessible for the scientific community, being today or in the future.

The analytical platform of the IGE brings together all the analytical infrastructures, highest level instruments and technologies necessary for optimal exploitation of ice cores. Russian researchers and students will take advantage of this platform to enhance the Elbrus reference core results and produce innovative scientific discoveries.

Another ice core will be entrusted to international repositories. It will contribute to the world's first ice archive sanctuary, relying on glaciers threatened by global warming. An ideal location for this repository will be Antarctica. A document for that purpose will be presented at the next consultative meeting of the Antarctic Treaty by Parties. The Antarctic Treaty system is the competent framework to address the issues related with Antarctica.

Elbrus drilling operation and ice core analysis are supported by the Russian Science Foundation grant 17-17-01270 and by ICE MEMORY program.

The expedition to Elbrus will be supported by the Institute of Geography Russian Academy of Sciences, which celebrates 100th anniversary in 2018. To celebrate this jubilee a large international scientific conference will be held in Moscow in June where leading scientists and geographers from all over the world will take part. This conference is supported by the corporation "Russian textbook", Russian Geographical Society, WWF Russia, RFBR.



Western Elbrus plateau, drilling site (5,100 m).

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FOLLOW THE MISSION!

Equipment transport, camp installation, drilling, ice cores handling and transportation, team's life: from June 10th to July 25th, follow the various stages of the Elbrus mission on Institute of geography and ICE MEMORY's Facebook accounts: **@ProtectingIceMemory**, **@geographic.ran**

Photos and videos will be available on the <http://fuga-media-stock.univ-grenoble-alpes.fr/> platform from May 25th and <http://igras.ru>

The drilling team consists of **Vladimir Mikhalenko** (Institute of Geography, Moscow), **Stanislav Kutuzov** (Institute of Geography, Moscow), **Ivan Lavrentiev** (Institute of Geography, Moscow), **Anna Kozachek** (Arctic and Antarctic Research institute, St. Petersburg), **Andrey Smirnov**, **Pavel Toropov** (Lomonosov Moscow State University), **Sarah Del Ben** (Wildtouch film director, France).

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An international scientific programme aimed at preserving climate memory

Over the last few decades, glaciologists have observed the effect of increased temperatures on the melting of glaciers, which hold the memory of former climates and environmental conditions, and which help to predict future environmental changes. Faced with this alarming observation, French glaciologists from CNRS, IRD and UGA at IGE laboratory (*Institut des géosciences de l'environnement, Grenoble*) and their Italian partners (University of Venice) decided to take action and launched the **ICE MEMORY** project in 2015, backed by the University Grenoble Alpes Foundation and under the patronage of the French and Italian national commissions of UNESCO.

Their primary goal: to create the world's first ice archive sanctuary, relying on glaciers threatened by global warming. Antarctica would be the ideal place for this long term storage. This possibility will be evaluated by the Antarctic Treaty Consultative Parties. These samples will be the property of humanity, with sustainable international governance ensuring their

preservation as well as their exceptional and appropriate use, in order to enable future generations of scientists to carry out unprecedented analyses.

The inaugural **ICE MEMORY** conference, organised in March 2017 in Paris under the patronage of UNESCO, marked the internationalisation of the programme, with the participation of fifteen Russian, American, Chinese, Brazilian, Swedish, Japanese, German, Swiss, Italian and French scientists specialised in ice core studies. The consortium hopes to unite the international community of glaciologists in order to carry out at least another twenty drilling missions on various glaciers around the world, during the next decade.

On October 17th 2017, the 202nd session of the UNESCO executive board, made up of 58 member states, adopted a decision on the **ICE MEMORY** initiative, thus acknowledging the scientific and cultural heritage significance of glaciers, as well as the relevance of the initiative, and encouraging the international community to take swift action.

Backed by the Université Grenoble Alpes Foundation, ICE MEMORY project unites the following partners: CNRS, IRD, Université Grenoble Alpes, National Research Council of Italy, Ca' Foscari University of Venice, Paul Scherrer Institute in Switzerland as well as IPEV (French Polar Institute) and the Italian Antarctic research programme (PNRA) as regards the cold chain logistics between Europe and the Antarctic plateau as well as the long-term storage at their jointly operated Concordia station which could be a hub for that purpose.

The project is equally jointly financed by the provision of human resources and equipment from partner scientific organisations and by private sponsorship, through the Université Grenoble Alpes Foundation. UGA's Foundation is happy to welcome a new 3 years Swiss based philanthropic partner: the Didier and Martine Primat's Foundation.

For further information: website, Wild Touch Production's film, press kit.

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