

Glaciers

The Observer

Scientists fly glacial ice to south pole to unlock secrets of global warming

High on Mont Blanc, huge ice cores are being extracted to help researchers study the alarming rate of glacial melt

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Scientists on the Col du Dôme site on the slopes of Mont Blanc. Photograph: Bruno Jourdain/LGGE / OSUG / UGA

In a few weeks, researchers will begin work on a remarkable scientific project. They will drill deep into the Col du Dôme glacier on Mont Blanc and remove a 130 metre core of ice. Then they will fly it, in sections, by helicopter to a laboratory in Grenoble before shipping it to Antarctica. There the ice core will be placed in a specially constructed vault at the French-Italian Concordia research base, 1,000 miles from the south pole.

The Col du Dôme ice will become the first of several dozen other cores, extracted from glaciers around the world, that will be added to the repository over the next few years. The idea of importing ice to the south pole may seem odd – the polar equivalent of taking coals to Newcastle – but the project has a very serious aim, researchers insist.

Earth’s glaciers are now melting at a unprecedented rate as a result of global warming – and that poses a serious scientific problem. As ice forms on a glacier, it encloses small bubbles of air that contain a sample of the atmosphere at that time. From these samples, scientists can measure atmospheric concentrations of gases such as carbon dioxide and methane over periods that range from hundreds to tens of thousands of years into the past.

“Ice cores are like books,” said project leader Jérôme Chappellaz, of the Glaciology Laboratory in Grenoble. “Each year a new layer of ice is put down and adds a page to that book, one that records data from a particular year of the glacier’s life. It tells us what concentration of gases and pollutants were in the atmosphere at a particular time. And the deeper we go down into the glacier, the further back in time we travel. Unfortunately, as our glaciers melt, the pages of these books – both the ancient and the more recent ones – are being destroyed.”

As a result, Chappellaz has set up the Saving Ice in Danger project [PDF], which aims to collect ice core samples and keep them for future analyses. “We are setting up the archive to prevent precious information about past climate change from being wiped from the face of the planet,” he added. “This is a race against time.”

An indication of the rate at which glaciers have been warming in recent years is provided by measurements that were taken between 1994 and 2005 on the Col du Dôme glacier. Researchers found that temperatures at the heart of the glacier rose by 1.5C in that decade, a rate that would melt the glacier totally in a few decades.

Nor is the problem confined to Europe. Across the globe, ice is disappearing at a staggering rate as rising carbon emissions bring global temperatures to record levels. The snows of Kilimanjaro have melted more than 80% since 1912, for example, while researchers fear most central and eastern Himalayan glaciers could disappear by 2035. Glacier National Park in Montana once contained 150 glaciers. Today there are only a couple of dozen and in a few decades nearly all the park’s glaciers are likely to have disappeared, scientists have warned.



Project leader Jérôme Chappellaz examines a sample. Photograph: Lucia Simion

The need to protect the precious information locked into the ice of these glaciers has become urgent, said Chappellaz. In a few weeks, he will co-ordinate the removal of the first ice core – from Col du Dôme, 4,350 metres high on the Mont Blanc massif – that will be taken to the Saving Ice in Danger vault in Antarctica. Next year, a core will be extracted from the Illimani glacier in Bolivia – which has been identified as the most threatened glacier in the Andes – and sent to Concordia.

“Speed will be critically important,” said Chappellaz. “We have to ensure there is minimal thawing before getting a core to a freezer. In the case of the Col du Dome core, we will helicopter it straight down the mountain to a cold store at ground level before shipping it to Antarctica.

“Illimani is too high for helicopters so we will have to employ porters to carry sections down – but only at night when temperatures are low enough to prevent thawing.”

Other glacier sites that have been targeted by Saving Ice in Danger include the Colle Gniffetti glacier on the Swiss-Italian border; the Huascarán glacier in the Andes; the Guliya glacier on the Tibetan plateau; the East Rongbuk near Mount Everest; and Mount Cook in New Zealand.

“With the exception of glaciers in the Western Himalayas, all the world’s great ice sheets are losing ice at an alarming rate and we are to have to act very quickly,” said Chappellaz.

The problem for the project is funding, however. “We cannot apply for standard science funding because we are not carrying out research,” he added. “We are trying to preserve a source of data for future research and so we are having to apply to private donors – fortunately with some success. The Prince Albert of Monaco Foundation has given us €2m to begin the project.”

As a result, scientists hope that in three or four years, a steady supply of ice core samples will be arriving in the vault at Concordia. And given that the average temperature at the site is around minus 50C, there is little danger that a power failure might lead to catastrophic thawing of samples. “This is one of the coldest places on Earth,” said Chappellaz. “We should be safe there for a while.”

CORE FACTS



Freshly harvested ice from the Mont Blanc site. Photograph: Bruno Jourdain, LGGE / OSUG / UGA

Studies of ice cores have played a key role in demonstrating that carbon dioxide levels in the atmosphere have a strong influence on climate change. They have shown that low concentrations occur during cold times and high concentrations in warm periods. This is entirely consistent with the idea that temperature and carbon dioxide levels are intimately linked and that each acts to amplify changes in the other.

“We see no examples in the ice-core record of a major increase in carbon dioxide that was not accompanied by an increase in temperature,” says the British Antarctic Survey on its webpage on ice cores and climate change.

As ice cores provide the data that has established this link, they have therefore played a key role in understanding how carbon emissions are driving global warming. Ironically, it is the impact of these emissions that now threatens this crucial source of data about our climate.

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