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Nunavik

June 1, 2007

Mud gives clear picture of ancient climate

"Sediment samples are like natural archives of the Earth's history."

JOHN THOMPSON

Nine metres of mud excavated from the bottom of Pingualuit, Nunavik's crater lake, may offer researchers a more clear view on how the Earth's climate changed over the past 120,000 years.

A team of researchers, led by Reinhard Pienitz from Laval University, spent 10 days in May camped out at the lake, which is known as "the crystal eye of Nunavik" because of its exceptionally clear waters, to haul up sediment core samples from the lake bed.

"Sediment samples are like natural archives of the Earth's history," Pienitz said Monday. "We can read the story of the past's climate."

The sediment core gathering brought together researchers from four countries and Inuit from the area. Clockwise, from top left: Inuit guides Peter Kaitainaq and Yaaka Yaaka from Kangiqsujuaq stand with Guillaume St-Onge from Université du Québec à Rimouski, Sonja Hausmann from the University of Arkansas, Reinhard Pienitz from Université Laval, Nathalie Girard from the Kativik Regional Government in Kuujjuaq, Veli-Pekka Salonen from Finland's University of Helsinki, and Richard Niederreiter from UWITEC in Austria.
(PHOTO COURTESY OF REINHARD PIENITZ)

"Reading the past is easier than reading the future."

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Pingualuit, formerly known as Chubb Crater, is a perfectly circular lake, 3.4 kilometres in diameter. It was formed when a meteorite slammed into the earth 1.4 million years ago.

Rain filled the crater, creating a lake with some of the clearest waters on Earth. "It's like a huge rain collector set out in the tundra," Pienitz said.

Most Canadian lakes are only as old as the last ice age, when glaciers that once reached as far south as Wisconsin began their slow retreat north, between 6,000 to 12,000 years ago.

But Pingualuit is different, researchers believe. The lip around the crater, and the depth of the lake - 267 metres - largely protected the lake from glaciers, which slid across the top of the crater, preserving the sediment on the lake bottom.

The stuff looks like mud to most people. But when Pienitz studies sediment, he sees history.

Traces of charcoal show when trees began to migrate north once the glaciers retreated. Pollen hints at the plants that grew nearby. And the fossilized remains of algae and tiny shrimp and bugs show what kind of life the water once supported.

Acids in the sediment samples also let researchers piece together the colour and temperature of lakes in the past.

Researchers dig into the ice at Pingualuit, Nunavik's crater lake, in order to retrieve nine metres of sediment from the lake bottom. These core samples contain 120,000 years worth of natural history, which researchers hope will reveal details about how the Earth's climate changed in the past.
(PHOTO COURTESY OF REINHARD PIENITZ)

To obtain such long-term climate records, until now, researchers have depended on core samples taken from Greenland, Antarctica, or the sea bed. Similar information about the climate of North America has not been available, until now, Pienitz said.

Researchers will spend the next several years analyzing the sediment retrieved from Pingualuit, but Pienitz said they are confident, after a quick examination of the core samples, that the sediment contains 120,000 years of natural history.

The last researchers to try to receive sediment samples from Pingualuit had their camp blown away by a wind storm. Pienitz's team had better luck, but still encountered their share of difficulties, beginning with news that the helicopter they ordered had broken down and would not be available.

So they travelled by snowmobile from Kangiqsuajuaq to the lake, which is 88 kilometres southwest of the community.

While riding over bumpy terrain with plenty of exposed rock, they jostled some of their equipment to pieces.

"It was a rough ride," Pienitz said.

Among the broken equipment was their electronically-powered winch. They had to make do with a hand winch, which meant they'd usually spend about an hour, but sometimes as long as half a day, to reel in their catch of sediment by hand, which became exhausting after several days.

They came to call their research station the "fitness centre on the lake."

"As soon as we pulled equipment out of the water, it froze almost instantly," Pienitz said. "The ropes on the winch became icicles. They wouldn't hold on to the winch any more. They'd slip."

Because of this, a stove to boil water became their most valued tool.

Researchers needed to follow strict conditions to avoid polluting the lake waters. No fuel-powered equipment was permitted. Snowmobiles stayed parked on the crater's rim. They carried their gear by foot.

They camped inside unfinished cabins near the crater, which are being built following the announcement in 2003 that the surrounding area will be Quebec's first northern park.

The researchers pulled up more than mud from the lake. They also caught Arctic char - to study, rather than eat - which Pienitz said looked completely different from other char caught in another nearby lake. Pingualuit char have enormous heads, scrawny bodies, and are unusually small.

"They look totally different," Pienitz said.

It appears there isn't much for fish to eat in Pingualuit. One char they caught still had the head of another, smaller fish in its mouth.

"They're cannibals," he said.

Studies on the fish may give researchers a better idea of how fish evolve over time, Pienitz said, and what strategies are used to survive in such unusually clear waters.

Researchers with Environment Canada will examine the char for traces of mercury, cadium, lead and other heavy metals, as well as persistent organic pollutants, such as PCBs.

Any contaminants found in the lake would have travelled through the atmosphere and be washed down by rain and snow.

Pienitz's research is paid for by the Canadian Foundation for Climate and Atmospheric Sciences.

Pingualuit is known as "the crystal eye of Nunavik" for its remarkably clear waters. It was formed 1.4 million years ago, when a meteorite collided with the Earth.
(FILE PHOTO)

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