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Baffin Island reveals dramatic scale of Arctic climate change

By Steve Connor, Science Editor

Study delves back into 200,000 years of history to demonstrate the devastating impact of global warming

A frozen lake on a remote island off Canada's northern coast has yielded remarkable insights into how the Arctic climate has changed dramatically over 50 years.

Muddy sediment from the bottom of the lake, some of it 200,000 years old, shows that Baffin Island, one of the most inhospitable places on Earth, has undergone an unprecedented warming over the past half-century. Scientists believe the temperature rise is probably due to human-induced warming. It has more than offset a natural cooling trend which began 8,000 years ago.

Instead of cooling at a rate of minus 0.C every 1,000 years - a trend that was expected to continue for another 4,000 years because of well-known changes to the Earth's solar orbit - Baffin Island, like the rest of the Arctic, has begun to get warmer, especially since 1950. The Arctic is now about 1.C warmer than it was in 1900, confirming that the region is warming faster than most other parts of the world.

Baffin Island, the largest island in the Arctic Canadian Archipelago, is subjected to prevailing northerly winds that keep average temperatures at about minus 8.5C, well below similar Arctic locations at a comparable latitude. Polar bears, arctic fox and arctic hares walk the island's territory while narwhal, walrus and beluga whale patrol its coastline.

The island is dotted with lakes, the bottoms of which have been periodically scoured by glaciers with each passing ice age. However, scientists have found that the sediments at the bottom of some of the lakes, which build up each year rather like tree rings, have survived this scouring process intact.

This has enabled the scientists to take core samples going back tens of thousands of years. One such lake on Baffin Island, known as CF8, has been found to have layers of sediment dating back 200,000 years, which makes it the oldest lake sediment bored from any glaciated parts of Canada or Greenland, according to the study published in the journal Proceedings of the National Academy of Sciences.

It is the CF8 lake that has provided scientists with the sediment core showing the unprecedented warming of Baffin Island over the past few decades, compared with a time span going back 200,000 years, a period which included two ice ages and three interglacial periods - and roughly the time that Homo sapiens has been on earth.

"The past few decades have been unique in the past 200,000 years in terms of the changes we see in the biology and chemistry recorded in the cores," said Yarrow Axford of the University of Colorado at Boulder. "We see clear evidence for warming in one of the most remote places on earth at a time when the Arctic should be cooling because of natural processes." The scientists found that certain cold-adapted organisms in the layers of sediment have decreased in frequency since about 1950. Larvae from species of Arctic midge, which only live in cold conditions, have abruptly declined and two species in particular have disappeared altogether.

Meanwhile, a species of lake alga or diatom that is better suited to warmer conditions has increased significantly over the same period, indicating longer periods when the lake's surface was free of ice, the scientists said. Other sediment measurements support a dramatic reversal of the natural cooling trend, they said.

As part of a 21,000-year cycle, the Arctic has been receiving progressively less summertime energy from the Sun for the past 8,000 years because of a well-established "wobble" in the Earth's solar rotation - the Earth is now 0.6 million miles further from the Sun during an Arctic summer solstice than it was in 1BC. This decline will not reverse for another 4,000 years, but changes to the climate of Baffin Island show that the cooling it should have caused has gone into reverse in the past few decades.

A separate team of scientists analysing Arctic lakes in Alaska found a similar warming trend in recent years compared to sediment records going back a few thousand years. They, too, concluded that the warming was unprecedented and could be explained by human activities, namely the build of man-made carbon dioxide in the atmosphere.

"The amount of energy we're getting from the Sun in the 20th century continued to go down, but the temperature went up higher than anything we've seen in the last 2,000 years," said Nicholas McKay of the University of Arizona in Tucson .

"The 20th century is the first century for which how much energy we're getting from the Sun is no longer the most important thing governing the temperature of the Arctic," said Dr McKay, when the study was published last month in the journal Science.

Baffin Island: An ancient trading post

*Baffin Island lies between Greenland and the northern coast of Canada and, for all its remoteness and inhospitable climate, it may have played an important role as a staging post on the first-ever transatlantic trade route.

Archaeologists have found wooden items and a length of yarn at Nunguvik in the south which they believe indicate that visiting Vikings were interacting with the local natives, known as the Dorset people, who lived on Baffin Island between 500BC and AD1500.

The scientists believe that the Dorset, who dressed in animal skins, did not know how to spin yarn, unlike the Vikings. The three-metre strand, found frozen in the tundra, was spun from arctic hare fur mixed with goat hair, similar to yarn found at Viking settlements on Greenland. There are no goats on Baffin Island.

Further evidence comes from one of the wooden carvings which shows two faces chin to chin. One has the features of indigenous North Americans, whose ancestors had an Asian origin, while the other shows a long, narrow face and nose with a heavy beard - a portrait perhaps of a visiting Viking.

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