# Sediment yields climate record for past half-million years

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Researchers here have used sediment from the deep ocean bottom to reconstruct a record of ancient climate that dates back more than the last half-million years.

The record, trapped within the top 20 meters (65.6 feet) of a 400-meter (1,312-foot) sediment core drilled in 2005 in the North Atlantic Ocean by the Integrated Ocean Drilling Program, gives new information about the four glacial cycles that occurred during that period.

The new research was presented today at the Chapman Conference on Abrupt Climate Change at Ohio State University's Byrd Polar Research Center. The meeting is jointly sponsored by the American Geophysical Union and the National Science Foundation.

Harunur Rashid, a post-doctoral fellow at the Byrd Center, explained that experts have been trying to capture a longer climate record for this part of the ocean for nearly a half-century. "We've now generated a climate record from this core that has a very high temporal resolution, one that is decipherable at increments of 100 to 300 years," he said.

While climate records from ice cores can show resolutions with individual annual layers, ocean sediment cores are greatly compressed with resolutions sometimes no finer than millennia

"What we have is unprecedented among marine records."

Dating methods such as carbon-14 are useless beyond 30,000 years or so, he said, so Rashid and his colleagues used the ratio of the isotopes oxygen-16 to oxygen-18 as a proxy for temperature in the records. The isotopes were stored in the remains of tiny sea creatures that fell to the ocean bottom over time.

When the researchers compared their record of past climate from the North Atlantic to a similar record taken from an ice core drilled from Dome C in Antarctica, they found it was remarkably similar.

"You can't miss the similarity between the two records, one from the bottom of the North Atlantic Ocean and the other from Antarctica," he said. "The record is virtually the same regardless of the location."

Surprisingly, Rashid's team was also able to score another first with their analysis of this sediment core - a record of the temperature at the sea surface in the North Atlantic.

They drew on knowledge readily known to chemists that the amount of magnesium trapped in calcite crystals can indicate the temperatures at which the crystals formed. The more magnesium present, the warmer the waters were when the tiny organisms were alive.

They applied this analysis to the remains of the benthic organisms in the cores and were able to develop a record of warming and cooling of the sea surface in the North Atlantic for the last half-million years.

Having this information will be useful as scientists try to understand how quickly the major ocean currents shifted as glacial cycles came and went, Rashid said.

The researchers were also able to gauge the extent of the ancient Laurentide Ice Sheet that covered much of North America during the

last 130,000 years.

As that ice sheet calved off icebergs into the Atlantic, Rashid said that the "dirty underbelly" of those icebergs carried gravel out into the ocean. As the bergs melted, the debris fell to the bottom and of the ocean floor. The more debris present, the more icebergs had been released to carry it, meaning that the ice sheet itself had to have been larger.

"Based on this, we've determined that the Laurentide Ice Sheet was probably largest during the last glacial cycle than it was during any of the three previous cycles," he said.

During the last glacial cycle, the Laurentide Ice Sheet was more than a kilometer (.6 miles) thick and extended to several miles north of Ohio State.

Source: The Ohio State University (news : web)