New study shows influence on climate of fresh water during last ice age

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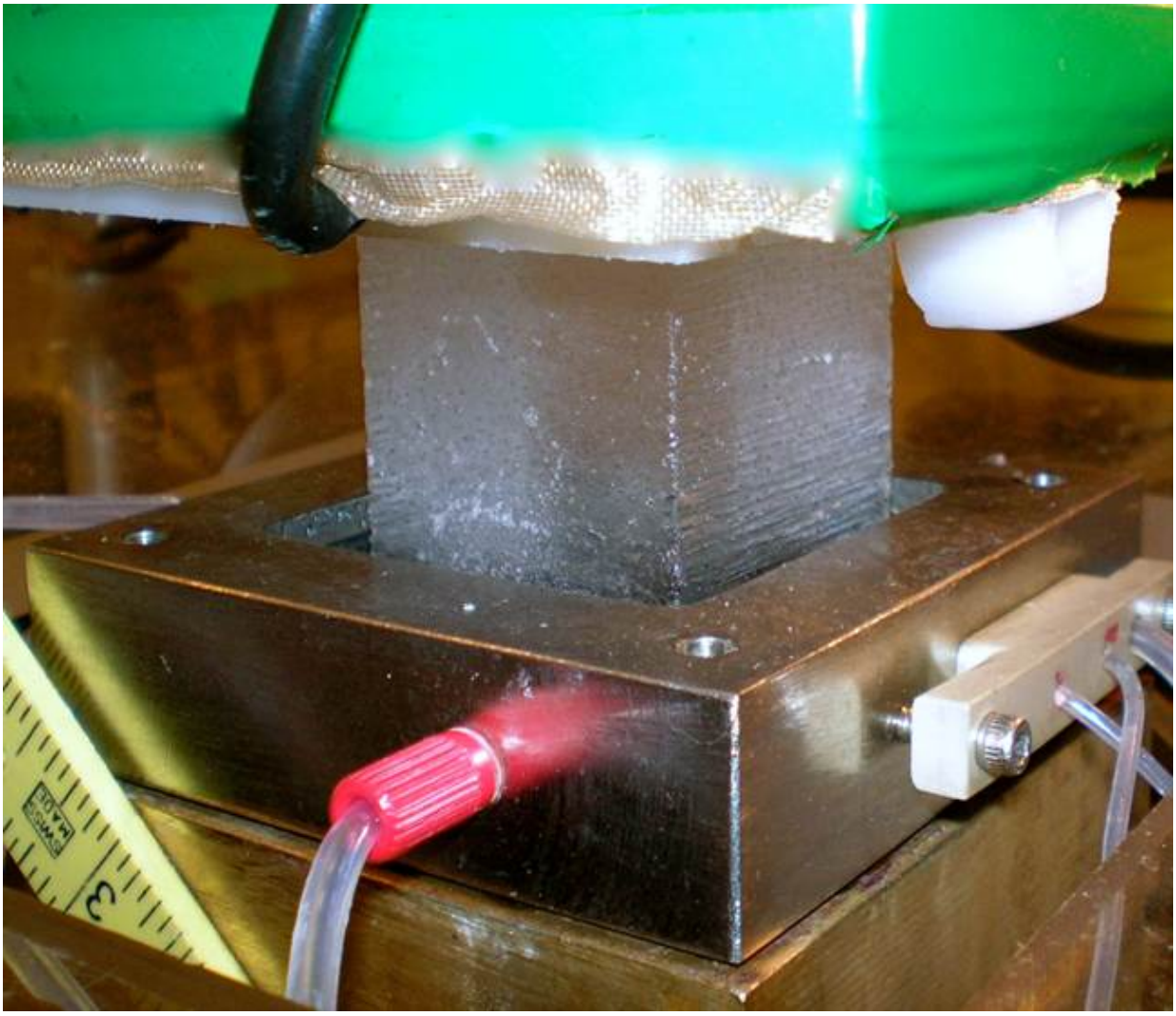

Ice core from the West Antarctic Ice Sheet. Credit: Oregon State University

A new study shows how huge influxes of fresh water into the North Atlantic Ocean from icebergs calving off North America during the last ice age had an unexpected effect - they increased the production of methane in the tropical wetlands.

Usually increases in methane levels are linked to warming in the Northern Hemisphere, but scientists who are publishing their findings this week in the journal *Science* have identified rapid increases in methane during particularly cold intervals.

These findings are important, researchers say, because they identify a critical piece of evidence for how the Earth responds to changes in climate.

"Essentially what happened was that the cold water influx altered the rainfall patterns at the middle of the globe," said Rachael Rhodes, a research associate in the College of Earth, Ocean, and Atmospheric Sciences at Oregon State University and lead author on the study, which was funded by the National Science Foundation. "The band of tropical rainfall, which includes the monsoons, shifts to the north and south through the year.

"Our data suggest that when the icebergs entered the North Atlantic causing exceptional cooling, the rainfall belt was condensed into the Southern Hemisphere, causing tropical wetland expansion and abrupt spikes in atmospheric methane," she added.

During the last ice age, much of North America was covered by a giant ice sheet that many scientists believe underwent several catastrophic collapses, causing huge icebergs to enter the North Atlantic - phenomena known as Heinrich events. And though they have known about them for some time, it hasn't been clear just when they took place and how long they lasted.

Antarctica. Credit: Andrew Thurber, Oregon State University

Rhodes and her colleagues examined evidence from the highly detailed West Antarctic Ice Sheet Divide ice core. They used a new analytical method perfected in collaboration with Joe McConnell at the Desert Research Institute in Reno, Nevada, to make extremely detailed measurements of the air trapped in the ice.

"Using this new method, we were able to develop a nearly 60,000-year, ultra-high-resolution record of methane much more efficiently and inexpensively than in past ice core studies, while simultaneously measuring a broad range of other chemical parameters on the same small

sample of ice," McConnell noted.

Utilizing the high resolution of the measurements, the team was able to detect methane fingerprints from the Southern Hemisphere that don't match temperature records from Greenland ice cores.

"The cooling caused by the iceberg influx was regional but the impact on climate was much broader," said Edward Brook, an internationally recognized paleoclimatologist from Oregon State University and co-author on the study. "The iceberg surges push the rain belts, or the tropical climate system, to the south and the impact on climate can be rather significant."

Concentrating monsoon seasons into a smaller geographic area "intensifies the rainfall and lengthens the wet season," Rhodes said.

"It is a great example of how inter-connected things are when it comes to climate," she pointed out. "This shows the link between polar areas and the tropics, and these changes can happen very rapidly. Climate models suggest only a decade passed between the iceberg intrusion and a resulting impact in the tropics."

The study found that the climate effects from the Heinrich events lasted between 740 and 1,520 years.

More information: Enhanced tropical methane production in response to iceberg discharge in the North Atlantic, www.sciencemag.org/lookup/doi/ … 1126/science.1262005

Provided by Oregon State University