Study Bolsters Greenhouse Effect Theory, Solves Ice Age Mystery

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Critics who dismiss the importance of greenhouse gases as a cause of climate change lost one piece of ammunition this week. In a new study, scientists found further evidence of the role that greenhouse gases have played in Earth's climate.
In Thursday's issue of the journal Geology, Ohio State University scientists report that a long-ago ice age occurred 10 million years earlier than once thought. The new date clears up an inconsistency that has dogged climate change research for years.

Of three ice ages that occurred in the last half-billion years, the earliest ice age posed problems for scientists, explained Matthew Saltzman, assistant professor of geological sciences at Ohio State.

Previous studies suggested that this particular ice age happened during a time that should have been very warm, when volcanoes all over the earth's surface were spewing carbon dioxide (CO_2) and other heat-trapping greenhouse gases into the atmosphere.

With CO_2 levels as much as 20 times higher than today, the late Ordovician period (460-440 million years ago) wasn't a good time for growing ice.

Critics have pointed to the inconsistency as a flaw in scientists' theories of climate change. Scientists have argued that today's global climate change has been caused in part by buildup of CO_2 in the atmosphere resulting from fossil fuel emissions.

But, critics have countered, if CO2 truly raises global temperatures, how could an ice age have occurred when a greenhouse effect much greater than today's was in full swing?

The answer: This particular ice age didn't begin when CO2 was at its peak -- it began 10 million years earlier, when CO2 levels were at a low.

"Our results are consistent with the notion that CO2 concentrations drive climate."

Saltzman and doctoral student Seth Young found that large deposits of quartz sand in Nevada and two sites in Europe -- Norway and Estonia -- formed around the same time, 440 million years ago. The scientists suspect that the sand formed when water levels fell low enough to expose quartz rock, so that wind and rain could weather the rock into sand.

The fact that the deposits were found in three different sites suggests that sea levels may have been low all over the world at that time, likely because much of the planet's water was bound in ice at the poles, Saltzman said.

Next, the scientists examined limestone sediments from the sites and determined that there was a relatively large amount of organic carbon buried in the oceans -- and, by extension, relatively little CO2 in the atmosphere -- at the same time.

Taken together, the evidence suggests that the ice began to build up some 10 million years earlier than when volcanoes began pumping the atmosphere full of the CO2 that ended the Ordovician ice age.

For Saltzman, the find solves a long-standing mystery.

Though scientists know with a great degree of certainty that atmospheric

CO2 levels drive climate change, there are certain mismatches in the geologic record, such as the Ordovician ice age -- originally thought to have begun 443 million years ago -- that seem to counter that view.

“How can you have ice when CO2 levels are through the roof? That was the dilemma that we were faced with. I think that now we have good evidence that resolves this mismatch,” Saltzman said.

Scientists at the three sites previously attributed these quartz deposits to local tectonic shifts. But the new study shows that the conditions that allowed the quartz sand to form were not local.

“If sea level is dropping globally at the same time, it can’t be a local tectonic feature,” Saltzman said. “It’s got to be the result of a global ice buildup.”

Saltzman wants to bolster these new results by examining sites in Russia -- where he hopes to find more evidence of sea level drop -- and in parts of South America and North Africa, which would have been covered in ice at the time.

Source: Ohio State University