New finding shows climate change can happen in a geological instant

October 7 2013, by Ken Branson

Morgan Schaller, James Wright, and the core sample that helped them understand what happened -- and how fast it happened -- 55 million years ago. Credit: James Wright, Rutgers University

(Phys.org) —"Rapid" and "instantaneous" are words geologists don't use very often. But Rutgers geologists use these exact terms to describe a climate shift that occurred 55 million years ago.

In a new paper in the *Proceedings of the National Academy of Sciences*, Morgan Schaller and James Wright contend that following a doubling in carbon dioxide levels, the surface of the ocean turned acidic over a period of weeks or months and global temperatures rose by 5 degrees centigrade – all in the space of about 13 years.

Scientists previously thought this process happened over 10,000 years.

Wright, a professor of earth and planetary sciences in the School of Arts and Sciences and Schaller, a research associate, say the finding is significant in considering modern-day climate change.

"We've shown unequivocally what happens when CO2 increases dramatically – as it is now, and as it did 55 million years ago," Wright said. "The oceans become acidic and the world warms up dramatically. Our current carbon release has been going on for about 150 years, and because the rate is relatively slow, about half the CO2 has been absorbed by the oceans and forests, causing some popular confusion about the warming effects of CO2. But 55 million years ago, a much larger amount of carbon was all released nearly instantaneously, so the effects are much clearer."

The window to this important decade in the very distant past opened when Wright helped a colleague, Kenneth Miller, and his graduate students split core samples they extracted from a part of southern New Jersey once covered by the ocean.

The patterns found in the long cylinder of sediment told a story. There were distinct clay bands about 2 centimeters thick occurring rhythmically throughout the cores.

A close-up of the core at the heart of Wright's and Schaller's work. Not the regluar dark bands -- "like a tree ring," Schaller said. Credit: James Wright, Rutgers University

"They called me over and said, 'Look at this," said Schaller. "What jumped out at me were these rhythmic clay layers, very cyclic. I thought, 'Wow, these have got to mean something."

Wright and Schaller surmised that only climate could account for the rhythmic pattern they saw. "When we see cycles in cores, we see a process," Schaller said. "In this case, it's like a tree ring. It's giving us a yearly account through the sediments."

This discovery provided the necessary data to finally solve the huge conundrum surrounding this event – the significant error in how fast the carbon was released.

Whatever the cause of the carbon release,—some scientists theorize that a comet struck the earth—Wright and Schaller's contention that it happened so rapidly is radically different from conventional thinking, and bound to be a source of controversy, Schaller believes.

"Scientists have been using this event from 55 million years ago to build models about what's going on now," Schaller said. "But they've been assuming it took something like 10,000 years to release that carbon, which we've shown is not the case. We now have a very precise record through the carbon release that can be used to fix those models."

Provided by Rutgers University

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