Atmospheric carbon dioxide buildup unlikely to spark abrupt climate change

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There have been instances in Earth history when average temperatures have changed rapidly, as much as 10 degrees Celsius (18 degrees Fahrenheit) over a few decades, and some have speculated the same could happen again as the atmosphere becomes overloaded with carbon dioxide.

New research lends support to evidence from numerous recent studies that suggest abrupt climate change appears to be the result of alterations in ocean circulation uniquely associated with ice ages.

"There might be other mechanisms by which greenhouse gases may cause an abrupt climate change, but we know of no such mechanism from the geological record," said David Battisti, a University of Washington atmospheric sciences professor.

Battisti was part of a team that used a numerical climate model coupled with an oxygen-isotope model to determine what caused climate shifts in a computer-generated episode that mimicked Heinrich events during the last ice age, from 110,000 to 10,000 years ago. Heinrich events produced huge numbers of North Atlantic Ocean icebergs that had broken off from glaciers.

The simulations showed the sudden increase in North Atlantic sea ice cooled the Northern Hemisphere, including the surface of the Indian Ocean, which reduced rainfall over India and weakened the Indian monsoon.

Battisti noted that while carbon dioxide-induced climate change is unlikely to be abrupt, the impacts of changing climate could be.

"When you lose a keystone species, ecosystems can change very rapidly," he said. "Smoothly retreating sea ice will cause fast warming if you live within a thousand kilometers of the ice. If warming slowly dries already semi-arid places, fires are going to be more likely."

Previous studies of carbonate deposits from caves in China and India are believed to show the intensity of monsoon precipitation through the ratio of specific oxygen isotopes. The modeling the scientists' used in the current study reproduced those isotope ratios, and they determined that the Heinrich events were associated with changes in the intensity of monsoon rainfall in India rather than East Asia.

The research is published online June 19 by *Nature Geoscience*.

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