Researchers find a 'great fizz' of carbon dioxide at the end of the last ice age

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Rutgers oceanographer Elisabeth Sikes wrapping up core samples during a recent research voyage.

Imagine loosening the screw-top of a soda bottle and hearing the carbon dioxide begin to escape. Then imagine taking the cap off quickly, and seeing the beverage foam and fizz out of the bottle. Then, imagine the pressure equalizing and the beverage being ready to drink.

Rutgers marine scientist Elisabeth Sikes and her colleagues say that something very similar happened on a grand scale over a 1,000 year period after the end of the last ice age - or glaciation, as scientists call it.

According to a paper published recently in the journal *Nature,* the last ice age featured a decrease in the amount of atmospheric carbon dioxide

and an increase in the atmospheric carbon 14, the isotope that guides scientists in evaluating the rate of decay of everything from shells to trees.

In recent years, other researchers have suggested that some of that carbon dioxide flowed back into the northern hemisphere rather than being entirely released into the atmosphere in the southern hemisphere.

Sikes and her colleagues disagree. Their data, taken from cores of ocean sediment pulled up from 600 meters to 1,200 meters below the South Pacific and Southern Ocean, suggest that this "de-gassing" was regional, not global. This has important implications for understanding what controls where and how CO2 comes out of the ocean, and how fast - or, to put it another way, what tightens or loosens the bottle cap.

Carbon dioxide and carbon 14 in the atmosphere and ocean are on opposite ends of an environmental pulley. When the level of carbon dioxide in the atmosphere increases, the level of carbon 14 drops, and vice versa. That's chemistry and ocean circulation. Biology also helps, because photosynthesizing organisms use carbon dioxide, then die and take it with them to the bottom. During the last ice age, the level of carbon dioxide in the atmosphere was lower because much of it was trapped in the bottom of the oceans.

The ventilation of the deep Southern Ocean - the circulation of oxygen through the deep waters - slowed considerably during the last ice age, causing carbon dioxide to build up. Sikes and her co-authors report that, as the ice began to melt, the oceanic bottle cap began to loosen, and the carbon dioxide began to leak back into the atmosphere. Then, as warming intensified, the cap came off, and the carbon dioxide escaped so quickly, and so thoroughly, that Sikes and her colleagues could find very little trace of it in the carbon 14 they examined in their samples.

Eventually, just like the carbonated drink in a bottle, equilibrium was established between the carbon dioxide in the atmosphere and the carbon dioxide in the ocean. Today, the carbon dioxide level in the atmosphere has been rising in the past 200 years pushing the levels in the ocean up. Human activity is responsible for that rise and the rise of other "greenhouse gases." Some people have suggested we can pull carbon dioxide out of the atmosphere and force it back down to the bottom of the oceans by manipulating the biology - growing algae, for instance, which would increase photosynthesis and send carbon dioxide to the bottom when the organisms die. But Sikes' results suggest that global warming could eventually result in another great fizz.

More information: Paper: www.nature.com/nature/journal/ … ull/nature09288.html

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