Seas Grow Less Effective at Absorbing Emissions

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The Earth's oceans, which have absorbed carbon dioxide from fuel emissions since the dawn of the industrial era, have recently grown less efficient at sopping it up, new research suggests.

Emissions from the burning of fossil fuels began soaring in the 1950s, and oceans largely kept up, scientists say. But the growth in the intake rate has slowed since the 1980s, and markedly so since 2000, the authors of a study write in a report in Thursday's issue of Nature.

The research suggests that the seas cannot indefinitely be considered a reliable "carbon sink" as humans generate heat-trapping gases linked to global warming.

The slowdown in the rise of the absorption rate resulted from a gradual change in the oceans' chemistry, the study found. "The more carbon dioxide the ocean absorbs, the more acidic it becomes and the less carbon dioxide it can absorb," said the study's lead author, Samar Khatiwala, a research scientist at the Lamont-Doherty Earth Observatory of Columbia University and a professor at the Georgia Institute of Technology.

"It's a small change in absolute terms," Dr. Khatiwala said. "What I think is fairly clear and important in the long term is the trend toward lower values, which implies that more of the emissions will remain in the atmosphere."

To calculate the slowdown, Dr. Khatiwala and his collaborators created a mathematical model using tens of thousands of measurements of seawater collected over the past 20 years, including temperature, salinity and the presence of manufactured chlorofluorocarbons as a reflection of industrial activity.

They then worked backward with the data to create a formula that estimated the accumulation of human-generated carbon dioxide in the oceans from 1765, the opening of the industrial era, to 2008.

Even as human-generated emissions of carbon dioxide increase, the oceans' uptake rate growth appears to have dropped by 10 percent from 2000 to 2007, Dr. Khatiwala said.

The last major research effort to measure industrial carbon uptake in the oceans was published in a 2004 Science study led by Christopher Sabine.

His methodology was different but arrived at similar conclusions.

Dr. Sabine used carbon dioxide measurements taken by more than 100 cruise ships to come up with a single figure: the oceans' total industrial carbon uptake until 1994.

Dr. Khatiwala's approach provides estimates of ocean carbon storage for every year from 1765 to 2008.

"Sabine's estimate was like a single fuzzy snapshot," Dr. Khatiwala said. "We've gone from that to having a relatively short movie of what happened from the start of the industrial era."

Dr. Sabine said he agreed with the analogy, pointing out that his estimate for uptake up to 1994 was very close to Dr. Khatiwala's for that period.

"Even though the techniques are completely different, they are in consensus at the one point that we can compare them," Dr. Sabine said.

Yet much work remains to be done to confirm the results and to expand upon them, Dr. Khatiwala said.