

Oceans absorbing carbon dioxide more slowly, scientist finds

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The world's oceans are absorbing less carbon dioxide (CO2), a Yale geophysicist has found after pooling data taken over the past 50 years. With the oceans currently absorbing over 40 percent of the CO2 emitted by human activity, this could quicken the pace of climate change, according to the study, which appears in the November 25 issue of *Geophysical Research Letters*.

Jeffrey Park, professor of geology and geophysics and director of the Yale Institute for Biospheric Studies, used data collected from atmospheric observing stations in Hawaii, Alaska and Antarctica to study the relationship between fluctuations in global temperatures and the global abundance of <u>atmospheric CO2</u> on interannual (one to 10 years) time scales. A similar study from 20 years ago found a five-month lag between interannual temperature changes and the resulting changes in <u>CO2 levels</u>. Park has now found that this lag has increased from five to at least 15 months.

"No one had updated the analysis from 20 years ago," Park said. "I expected to find some change in the lag time, but the shift was surprisingly large. This is a big change."

With a longer lag time, atmospheric CO2 can no longer adjust fully to cyclical <u>temperature fluctuations</u> before the next cycle begins, suggesting that the oceans have lost some of their ability to absorb CO2 from the atmosphere. Weaker CO2 absorption could be caused by a change in ocean circulation or just an overall increase in the surface temperature.



"Think of the oceans like soda," Park said. "Warm cola holds less fizz," Park said. "The same thing happens as the oceans warm up."

Increases in CO2 levels have tended to precede increases in temperature over the past century, with the human influence on climate accumulating over many decades of burning <u>fossil fuels</u> and clearing forests. However, this relationship is reversed on interannual time scales, with multiyear temperature cycles leading multiyear cycles in CO2 levels.

Park found particularly strong correlations between sea-surface temperatures and CO2 levels in tropical <u>ocean</u> areas. Conversely, in places with a lot of trees and other biomass to soak up much of the atmospheric CO2, there was little or no correlation between temperature and CO2 on interannual time scales. In those places, such as the vast forests of North America and Eurasia, a large annual CO2 cycle synchronizes with the seasonal growth and decay of plants.

"Researchers have used climate models that suggest the oceans have been absorbing less CO2, but this is the first study to quantify the change directly using observations," Park said. "It strengthens the projection that the oceans will not absorb as much of our future CO2 emissions, and that the pace of future climate change will quicken."

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