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Climate Change Affects Southern Ocean Carbon Sink

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A NOAA ESRL scientist was an author on a paper published in *Science* last week that presents evidence that recent climate change has weakened one of the Earth's natural carbon 'sinks' the Southern Ocean. A four-year study by scientists from seven countries led by principal investigators from the University of East Anglia (UEA), the British Antarctic Survey (BAS) and the Max-Planck Institute for Biogeochemistry along with a NOAA ESRL co-author, suggests that an increase in wind speeds over the Southern Ocean, possibly caused by increased greenhouse gases coupled with ozone depletion, may have led to a release of stored oceanic CO₂ into the atmosphere, and may be slowing further absorption of greenhouse gases into the Southern Ocean sink.

Background:

Since the beginning of the industrial revolution the world's oceans have absorbed about a quarter of the 500 billion tons of carbon emitted into the atmosphere by humans. The possibility that in a warmer world the Southern Ocean – the strongest ocean CO₂ sink – is weakening is a cause for concern. The saturation of the Southern Ocean outlined in the paper was revealed by scrutinizing observations of atmospheric CO₂ from 40 stations around the world, many of them sites in the NOAA cooperative global air sampling network. Since 1981 the Southern Ocean sink ceased to increase, whereas CO₂ emissions increased by 40% over the same period. In general, ocean sinks are expected to increase in response to the increase of CO₂ in the atmosphere.

Significance:

As quoted by the lead author, "This is the first time that we've been able to say that climate change itself is responsible for the saturation of the Southern Ocean sink. This is serious. All climate models predict that this kind of 'feedback' will continue and intensify during this century. The Earth's carbon sinks – of which the Southern Ocean accounts for 15% – absorb about half of all human carbon emissions. With the Southern Ocean reaching its saturation point more CO₂ will stay in our atmosphere."

This new research suggests that stabilization of atmospheric CO₂ may be more difficult to achieve than previously thought. Additionally, acidification in the Southern Ocean is likely to reach elevated levels earlier than the once projected date of 2050.

* Le Quéré, C., C. Rödenbeck, E. T. Buitenhuis, T. J. Conway, R. Langensfelds, A. Gomez, C. Labuschangne, M. Ramonet, T. Nakazawa, N. Metzl, N. P. Gillett and M. Heimann (2007), Saturations of the Southern Ocean CO₂ sink due to recent climate change, *Science Express* (www.scienceexpress.org/17 May

2007/Page1/10.1126/science.1136188).

Contact information

Name: Tom Conway

Tel: (303) 497-6681

Thomas.J.Conway@noaa.gov

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