BBC NEWS

Polar ocean 'soaking up less CO2'

By Paul Rincon
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One of Earth's most important absorbers of carbon dioxide (CO2) is failing to soak up as much of the greenhouse gas as it was expected to, scientists say.

The decline of Antarctica's Southern Ocean carbon "sink" - or reservoir - means that atmospheric CO2 levels may be higher in future than predicted.

These carbon sinks are vital as they mop up excess CO2 from the atmosphere, slowing down global warming.

The study, by an international team, is published in the journal Science.

This effect had been predicted by climate scientists, and is taken into account - to some extent - by climate models. But it appears to be happening 40 years ahead of schedule.

The data will help refine models of the Earth's climate, including those upon which the predictions of the Intergovernmental Panel on Climate Change (IPCC) are based.

Of all the CO2 emitted into the atmosphere, only half of it stays there; the rest goes into carbon sinks.

There are two major natural carbon sinks: the oceans and the land "biosphere". They are equivalent in size, each absorbing a quarter of all CO2 emissions.

The Southern Ocean is thought to account for about 15% of all carbon sinks.

Sink efficiency

It was assumed that, as human activities released more CO2 into the atmosphere, ocean sinks would keep pace, absorbing a comparable percentage of this greenhouse gas.

The breakdown in efficiency of these sinks was an expected outcome, but not until the second half of the 21st Century.

Lead researcher Corinne Le Quere and colleagues collected atmospheric CO2 data from 11 stations in the Southern Ocean and 40 stations across the globe.

Measurements of atmospheric CO2 allowed them to infer how much carbon dioxide was taken up by sinks. The team was then able to see how efficient they were in comparison to one another at absorbing CO2.

"Ever since observations started in 1981, we see that the sinks have not increased [in their absorption of CO2]," Corinne LeQuere told the BBC's Science in Action programme.

"They have remained the same as they were 24 years ago even though the emissions have risen by 40%."

The cause of the decline in the Southern Ocean sink, the researchers explain, is a rise in windiness since 1958.

This increase in Southern Ocean winds has been attributed to two factors.

The first is the depletion of ozone in the upper atmosphere, which changes the temperature of this region.

The second is recent climate change, which warms the tropics more than the Southern Ocean.

Both these processes change atmospheric circulation over the Southern Ocean, resulting in stronger winds.

Churning waters

Oceans store much of their CO2 in deep waters. But, explained Dr Le Quere, "as the winds increase, the water in the ocean mixes more".

The British Antarctic Survey (BAS) scientist added: "The CO2 that would normally be in the deep ocean and would just stay there instead gets brought up to the surface and outgasses to the atmosphere."

The ocean surface becomes saturated with CO2 and cannot take up any more from the atmosphere.

Dr Sus Honjo, from the Woods Hole Oceanographic Institution (WHOI) in Massachusetts, US, is working on a separate project to assess the efficiency of the Southern Ocean carbon sink, using a different method.

He said recent developments in technology now made possible very detailed monitoring of marine carbon sinks, with some data available in real time.

"We have been way behind the modellers, who are hungry for numbers. But now we are starting to catch up because of the new tools and instruments available," he told BBC News.

Dr Honjo said recent evidence suggested the north-western Pacific appeared to be another significant CO2 sink.

As CO2 is absorbed by the oceans, it makes them more acidic, harming populations of marine organisms such as coral. The latest study suggests that phenomenon will only get worse over the century.

"The problem is that the extra CO2 from human emissions stays in the surface ocean and does not get removed to deep waters," said Dr Le Quere.

"So the problem gets worse, because the biological organisms affected by ocean acidification live, of course, at the surface where there is sunlight."

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