

Amazon carbon sink threatened by drought

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The Amazon is surprisingly sensitive to drought, according to new research conducted throughout the world's largest tropical forest. The 30-year study, published today in *Science*, provides the first solid evidence that drought causes massive carbon loss in tropical forests, mainly through killing trees.

"For years the Amazon forest has been helping to slow down climate change. But relying on this subsidy from nature is extremely dangerous", said Professor Oliver Phillips, from the University of Leeds and the lead author of the research.

"If the earth's carbon sinks slow or go into reverse, as our results show is possible, carbon dioxide levels will rise even faster. Deeper cuts in emissions will be required to stabilise our climate."

The study, a global collaboration between more than 40 institutions, was based on the unusual 2005 drought in the Amazon. This gave scientists a glimpse into the region's future climate, in which a warming tropical North Atlantic may cause hotter and more intense dry seasons.

The 2005 drought sharply reversed decades of carbon absorption, in which Amazonia helped slow climate change.

In normal years the forest absorbs nearly 2 billion tonnes of carbon dioxide. The drought caused a loss of more than 3 billion tonnes. The total impact of the drought - 5 billion extra tonnes of carbon dioxide in the atmosphere - exceeds the annual emissions of Europe and Japan

combined.

"Visually, most of the forest appeared little affected, but our records prove tree death rates accelerated. Because the region is so vast, even small ecological effects can scale-up to a large impact on the planet's carbon cycle," explained Professor Phillips.

Some species, including some important palm trees, were especially vulnerable", said Peruvian botanist and co-author Abel Monteagudo, "showing that drought threatens biodiversity too."

The Amazon accounts for more than half of the world's rainforest, covering an area 25 times as great as the United Kingdom. No other ecosystem on Earth is home to so many species nor exerts such control on the carbon cycle.

The study involved 68 scientists from 13 countries working in RAINFOR, a unique research network dedicated to monitoring the Amazonian forests.

To calculate changes in carbon storage they examined more than 100 forest plots across the Amazon's 600 million hectares, identified and measured over 100,000 trees, and recorded tree deaths as well as new trees. Weather patterns were also carefully measured and mapped.

In the wake of the 2005 drought the RAINFOR team took advantage of this huge natural experiment, and focused their measurements to assess how the drought had affected the forest.

The study found that for at least 25 years the Amazon forest acted as a vast carbon sink. A similar process has also been occurring in Africa.

In fact, over recent decades the tropical forests have absorbed one fifth

of global fossil fuel emissions.

But in 2005 this process was reversed. Tree death accelerated most where drought was strongest, and locations subject even to mild drying were affected. Because of the study, we now know the precise sensitivity of the Amazon to warming and drought.

If repeated, Amazon droughts will accelerate climate warming and make future droughts even more damaging.

Source: University of Leeds

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