

How plants are working hard for the planet

May 16 2019



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As the planet warms, plants are working to slow the effect of human-caused climate change—and research published today in *Trends in Plant Science* has assessed how plants are responding to increasing carbon dioxide (CO₂).

"We know that terrestrial plants are currently absorbing more CO₂ than is released into the atmosphere through the combination of fire, decomposition, plant respiration, and land-use change," lead researcher Lucas Cernusak said.

"This is commonly known as the land carbon sink, and we know it's currently slowing the rate at which atmospheric CO₂ is increasing. What we don't know is how strong that response is, and how long we can count on it."

Associate Professor Cernusak, a terrestrial ecologist at James Cook University in Cairns, Australia, worked with colleagues from CSIRO Oceans and Atmosphere in Canberra and the Université de Lorraine in France to measure the strength of the terrestrial biosphere's response to increasing CO₂.

They focussed on [photosynthesis](#)—the process in which [plants](#) capture energy from the sun and use it to synthesize carbohydrates from CO₂ and water—and examined terrestrial gross primary productivity (GPP), a measure of global photosynthesis.

Their modelling and analysis revealed that, since the beginning of the industrial era, photosynthesis has increased in nearly constant proportion to the rise in atmospheric CO₂.

"We expected the two would correlate, since CO₂ stimulates photosynthesis, but given the complexity of plant and environmental interactions we were impressed by how closely they have kept pace," Associate Professor Cernusak said.

"We can say that plants are working hard—the response is at the highest end of the expected range."

The researchers used a combination of existing analyses and new modelling, alongside laboratory studies, to examine how increased CO₂ affects photosynthesis, from individual leaves up to a global scale.

"This is an important step forward in the long and complex task of gauging how terrestrial vegetation will respond to climate change in the longer term," Associate Professor Cernusak said.

While increased CO₂ has allowed an increase in photosynthesis and global leaf area, the researchers warn that further [climate change](#)—with increasing frequency of events such as heat waves, droughts and storms—has the potential to significantly stress terrestrial vegetation and decrease production.

"It's also important to remember that global change will manifest differently in different regions," Professor Cernusak said.

"Our observations and modeling analyses suggest that in high latitude ecosystems it's global warming that is driving the increase in leaf area and growing-season length.

"That's quite different from the tropics, where our study indicates that CO₂ fertilization is driving the growth in photosynthesis, while climbing temperatures can create significant stress for some plant species."

Provided by James Cook University

Citation: How plants are working hard for the planet (2019, May 16) retrieved 23 April 2024 from <https://phys.org/news/2019-05-hard-planet.html>

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