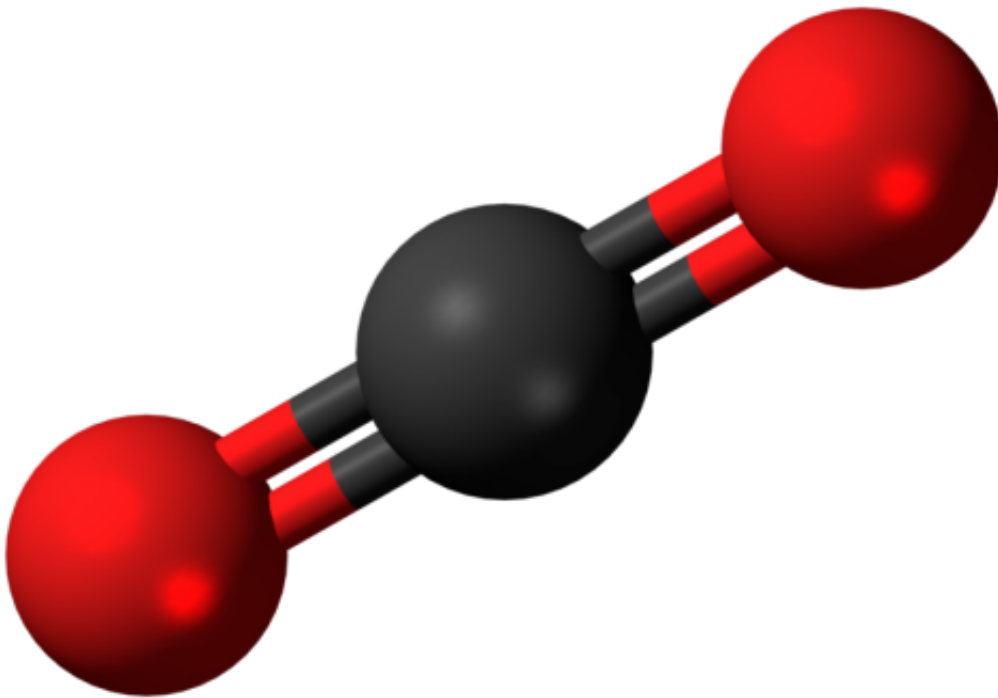


Satellite observations show global plant growth is not keeping up with CO₂ emissions

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Ball-and-stick model of carbon dioxide. Credit: Wikipedia

Because plants need carbon dioxide to grow, scientists have expected rising atmospheric CO₂ to substantially enhance plant growth, offsetting a portion of human CO₂ emissions and, in turn, slowing climate change. However, new research from the Institute on the Environment published today in *Nature Climate Change* adds to a growing body of research

challenging this expectation.

The study, led by William Kolby Smith, a Luc Hoffman Institute postdoctoral fellow working with IonE's Global Landscapes Initiative and the Natural Capital Project, found that global plant growth has indeed increased over the past 30 years, but not as much as expected given the change in atmospheric CO₂ concentrations. Comparing their findings with results of widely used on-the-ground measurements and the best available models of plant responses to increasing CO₂, Smith and colleagues concluded that current model estimates of plants' ability to offset growing [greenhouse gas emissions](#) may be unrealistically optimistic.

"Current Earth system models assume that global plant growth will provide the tremendous benefit of offsetting a significant portion of humanity's CO₂ emissions, thus buying us much needed time to curb emissions," says Smith. "Unfortunately, our observation-based estimates of global vegetation growth indicate that plant growth may not buy us as much time as expected, [so] action to curb emissions is all the more urgent."

The authors identify two important factors that could be driving the divergence between satellite-based results and model-based results: availability of water and availability of nutrients. Satellite data indicate that warmer climate conditions resulting from rising atmospheric CO₂ may be increasing plant water stress, counteracting any positive effect of CO₂. Additionally, limited availability of nitrogen and phosphorus in the environment could also limit the ability of plants to soak up additional CO₂ (see also previous work co-authored by Smith).

These findings indicate that current climate models do not accurately predict future plant growth and suggest that allowable emissions targets based on these models may need reevaluation. The authors recommend

better integration among model, satellite and on-the-ground measurement approaches to improve our understanding of the effects of rising atmospheric CO₂ on [plant growth](#).

The work provides an important step forward in the understanding of how plants may respond (or not respond) to rising atmospheric CO₂, as well as highlights ways scientists from different specialties can work together to reach a deeper understanding of how ecosystems will respond to global change, says Sasha Reed, a U.S. Geological Survey scientist and co-author of the paper. "We have many scientific tools in our toolbox, and bringing them together is a powerful approach to asking questions and to solving problems."

More information: Large divergence of satellite and Earth system model estimates of global terrestrial CO₂ fertilization, [DOI: 10.1038/nclimate2879](#)

Provided by University of Minnesota

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