New Insights into Plant Uptake of Carbonyl Sulfide Aid Global Carbon Cycle Model

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Global Monitoring Division - **ESRL-GMD**
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In a study published in Science on 14 November, NOAA and CIRES scientists and colleagues show that carbonyl sulfide (COS), a trace gas consumed by plants, provides quantitative evidence that gradients of COS during the growing season are controlled by plant uptake during photosynthesis. This in turn provides an independent measure of plant photosynthesis rates crucial for carbon cycle modeling, a constraint heretofore missing in such models.

Background. On average, 40% of the anthropogenic carbon dioxide emitted to the atmosphere each year is absorbed by the land and ocean ecosystems. The terrestrial biosphere is responsible for much of this uptake, but it varies substantially from year-to-year owing to feedbacks between climate, photosynthesis, and respiration that are poorly understood. Climate models incorporate photosynthesis-climate feedbacks, yet tools for validating these critical processes within models on large-scales are lacking. As shown in the paper, tests with sophisticated 3-D model simulations of COS and CO2 over North America show that COS measurements can provide constraints on photosynthesis rates and thereby allow scientists to directly study the sensitivities of the carbon cycle to changes in climate in ways that were not possible previously. The gradient data were obtained from air samples collected across the U.S. from aircraft during a short NASA study and from an ongoing NOAA project.

Importance. Improving our understanding of the feedbacks and sensitivities between the terrestrial carbon cycle and climate is critical for accurately projecting future atmospheric concentrations of CO2. This new study takes an important step forward in describing how COS could improve our understanding of these important feedbacks.

More information: http://www.esrl.noaa.gov/gmd/hats

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