NASA Satellite Adds Carbon Dioxide to its Repertoire

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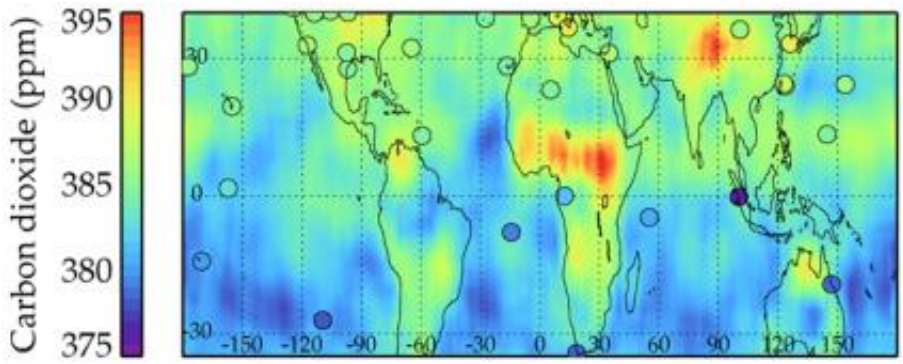

TES measurements of the distribution of carbon dioxide at an altitude of 5 kilometers (3.1 miles) between March and May 2006 are compared with NOAA GLOBALVIEW carbon dioxide measurements collected at surface sites (circles). Image credit: NASA/JPL

(PhysOrg.com) -- A NASA-led research team has expanded the growing global armada of remote sensing satellites capable of studying carbon dioxide, the leading greenhouse gas driving changes in Earth's climate.

The newest addition is the Tropospheric Emission Spectrometer (TES) instrument on NASA's Aura spacecraft, launched in 2004. TES measures the state and composition of Earth's troposphere, the lowest layer of Earth's atmosphere, located between Earth's surface and about

16 kilometers (10 miles) in altitude. While TES was not originally designed to measure carbon dioxide, a team led by Susan Kulawik of NASA's Jet Propulsion Laboratory, Pasadena, Calif., has successfully developed and validated a TES carbon dioxide tool.

Kulawik's team analyzed three years of carbon dioxide data from TES and compared them to other carbon dioxide data sources. These sources included the Atmospheric Infrared Sounder (AIRS) instrument on NASA's Aqua spacecraft, aircraft and ground station samples, and two National Oceanic and Atmospheric Administration carbon dioxide research tools: GLOBALVIEW-CO2 and CarbonTracker. The TES data were found to be in good agreement with the other data. The TES study appears in the journal Atmospheric Chemistry and Physics.

Kulawik says TES data may be able to help significantly reduce uncertainties in annual regional estimates of where carbon dioxide is being created (sources) and where it is being stored (sinks).

"It's easy to see why you need measurements near Earth's surface, but TES measurements in the region of the atmosphere where carbon dioxide gets transported around the globe are also key to understanding carbon dioxide sources and sinks," Kulawik said.

Study co-authors Ray Nassar and Dylan Jones of the University of Toronto, Ontario, Canada, found that TES data can reduce -- by approximately 70 percent -- uncertainties in estimates of how much carbon dioxide is being released and stored in South America's tropical rain forests and Africa's grasslands. These include the Amazon, Congo and surrounding savannahs.

"These regions have a major influence on the global carbon cycle," said Jones. "The new carbon dioxide data from TES will help scientists reduce uncertainties in our understanding of carbon dioxide, particularly

in tropical regions, where there are currently very few surface or aircraft measurements."

Carbon dioxide is the most important human-produced greenhouse gas. Its current global average concentration in Earth's atmosphere is about 389 parts per million by volume, increasing by about two parts per million each year. This concentration varies seasonally and by hemisphere. Estimates are challenging, as it varies by less than two percent globally in the mid-troposphere.

Currently, about 55 percent of human-produced carbon dioxide remains in the atmosphere; the rest is stored in the ocean and by land plants, but exactly where remains a mystery. Recent studies have shown carbon dioxide emissions from fossil fuel combustion have been increasing faster than predicted, while the southern hemispheric oceans' capacity for storing carbon dioxide may be diminishing. Scientists want to better understand carbon dioxide sources and sinks so they can more reliably predict future atmospheric carbon dioxide levels, assess the impact of land use changes on atmospheric carbon dioxide, develop mitigation strategies and verify international treaties.

The new TES carbon dioxide data complement the available international space-based resources for measuring carbon dioxide. These include AIRS; Envisat's European Scanning Imaging Absorption Spectrometer for Atmospheric Chartography (SCIAMACHY); the European MetOp Infrared Atmospheric Sounding Interferometer (IASI); and the Japan Aerospace Exploration Agency's Greenhouse gases Observing Satellite (GOSAT). The Orbiting Carbon Observatory mission, NASA's first spacecraft dedicated to studying carbon dioxide and its sources and sinks, was lost in a launch vehicle mishap in February 2009. It is currently being rebuilt for a planned launch in 2013.

TES will measure carbon dioxide in the troposphere at altitudes between

2 and 8 kilometers (1.2 to 5 miles), with peak sensitivity at around 5 kilometers (3.1 miles). It will produce carbon dioxide products at latitudes between 40 degrees south and 45 degrees north. The team expects to release daily and monthly TES carbon dioxide data products to the public starting this July.

Provided by JPL/NASA