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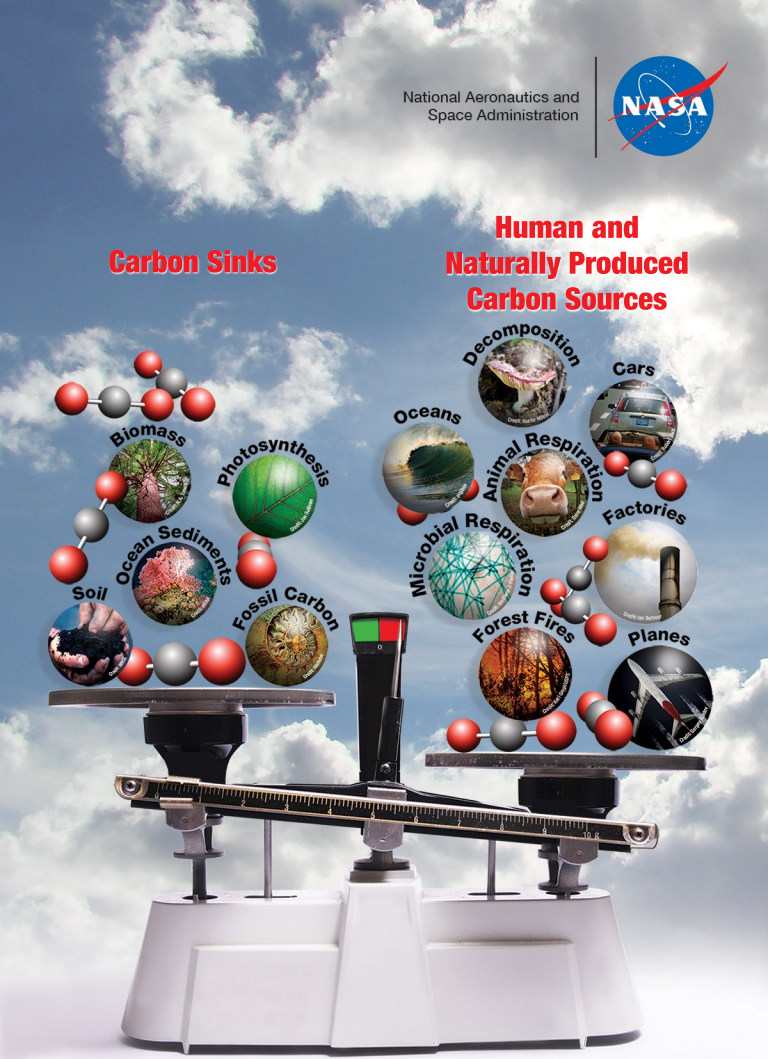


www.nasa.gov

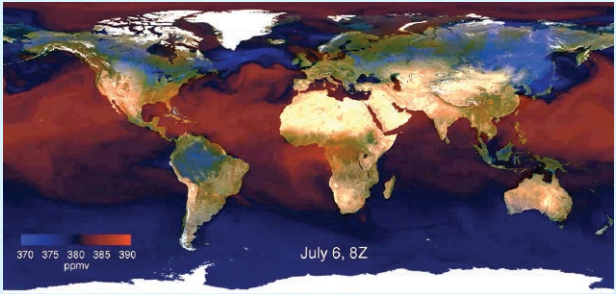
Observing CO_2 in the Earth System

All living and once-living things (i.e., biomass) are made of carbon, the fourth most abundant element in our universe. Carbon dioxide, or CO_2, is the most abundant carbon bearing gas, and plays a special role in Earth's carbon cycle. From an atmospheric perspective, *sources* emit or release carbon into the atmosphere, primarily as CO_2, while *sinks* remove CO_2 from the atmosphere. Natural and anthropogenic (i.e., human-induced) sources and sinks can be found almost anywhere in the world, however, human activities are causing the sources of carbon to outweigh the sinks. For example, each time humans use coal or natural gas (e.g., methane) to generate electricity, drive a petroleum-powered car, or cut down a forest, CO_2 is released into the atmosphere—and unlike natural processes that stay roughly in balance, these human activities absorb little or no CO_2 in return. Such activities are contributing to a rise in atmospheric CO_2, which impacts Earth's climate system.

At the beginning of the Industrial Revolution, CO_2 levels in the atmosphere were roughly 278 parts per million (ppm). Fossil fuel combustion and other human activities are now increasing the atmospheric CO_2 abundance to unprecedented rates. In May of 2013, these emissions pushed the monthly average CO_2 concentrations above 400 ppm, a level that has not been reached during the past 800,000 years.

The Orbiting Carbon Observatory-2, or OCO-2, is the first NASA satellite dedicated to monitoring CO_2, and it will do so with greater precision and detail than current instruments. This new data will help scientists understand where CO_2 is being emitted and removed from the atmosphere, subsequently allowing them to make projections of how Earth's climate might respond to these changes in the future.

For more information on OCO-2, visit: www.nasa.gov/oco2 and oco.jpl.gov



The map here shows simulated average column concentrations of CO_2 in the atmosphere from OCO-2 on July 6, 2005. Red shades represent regions where CO_2 concentrations are enhanced by carbon sources (e.g., from human activities), while blue shades represent regions where the CO_2 concentrations are reduced by carbon sinks (e.g., by photosynthesis). Note that global concentrations of atmospheric CO_2 remain high in some parts of the Northern Hemisphere during summer, when vegetation absorbs a substantial amount of CO_2 through photosynthesis. Image credit: NASA/Global Modeling and Assimilation Office

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