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# MEASURING CO2 FROM SPACE: THE NASA ORBITING CARBON OBSERVATORY-2

**Abstract**

Fossil fuel combustion and other human activities are emitting more than 30 billion tons of carbon dioxide (CO2) into the atmosphere every year. Interestingly, atmospheric CO2 measurements currently being collected by a global network of surface stations indicate that less than half of this CO2 is accumulating in the atmosphere. The remainder is apparently being absorbed by CO2 "sinks" in the ocean and the terrestrial biosphere whose nature and location is poorly understood. While the existing surface greenhouse gas monitoring network has expanded continuously over the past 50 years and now provides the accuracy and coverage needed to quantify the abundance of this gas on global scales, it still lacks the spatial and temporal resolution and coverage needed to identify and quantify CO2 sources and sinks on regional scales or to quantify emissions from discrete point sources. One way to address this problem is to collect spatially-resolved, global measurements of the column-averaged CO2 dry air mole fraction, XCO2, from space. Precise measurements are needed for this application because surface sources and sinks of CO2 produce small spatial and temporal variations in XCO2. While surface sources and sinks can change the atmospheric CO2 mixing ratios by as much as 8% near the ground (¿30 ppm), these perturbations decay rapidly with height, such that XCO2 variations rarely exceed 2% (8 ppm) on regional to global scales. Existing measurements show that XCO2 variations are usually no larger than 0.3% (1 ppm) on regional scales, and that these variations have representative spatial scales that range from 100 km over continents to 1,000 km over the ocean.

The Orbiting Carbon Observatory (OCO) was the first NASA satellite designed to measure CO2 from space with the precision, resolution, and coverage needed to detect CO2 surface fluxes. OCO was designed to collect 0.5 to 1 million soundings each day. Typical measurements over land were expected to have precisions of 0.25% within surface footprints smaller less than 3 square km. This project suffered a major setback in February 2009 when the OCO launch vehicle failed to achieve orbit and the satellite was lost. The U.S. Congress has since authorized a restart of the OCO project, and the President's 2010 budget proposal includes funding to produce a "carbon copy" of OCO that could be ready for launch by February 2013. This presentation will summarize the status and plans for this new mission, which has been designated OCO-2.