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The Orbiting Carbon Observatory (OCO-2) Mission and Experience Gained from the Greenhouse gases Observing Satellite (GOSAT)

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The NASA Orbiting Carbon Observatory (OCO-2) will make space-based measurements of atmospheric CO_2 with the precision, resolution, and coverage needed to characterize CO_2 sources and sinks on regional scales and quantify their variability over the seasonal cycle. The OCO-2 mission will be a 'carbon copy' of the OCO mission, to minimize schedule and cost risks. The OCO-2 instrument has been built and is undergoing testing and characterization.

OCO-2 will carry a single instrument that incorporates 3 high resolution grating spectrometers that will make bore-sighted measurements of reflected sunlight in near-infrared CO_2 and molecular oxygen (O_2) absorption bands. These measurements will be combined to provide spatially resolved estimates of the column-averaged CO_2 dry air mole fraction, XCO_2. The instrument collects 12 to 24 XCO_2 soundings/second over the sunlit portion of the orbit, yielding 200 to 400 soundings per degree of latitude, or 0.5 to 1 million soundings every day. Thick clouds and aerosols will reduce the number of soundings available for XCO_2 retrievals by 80-90%, but the remaining data is expected to yield XCO_2 estimates with accuracies of $\sim$0.3 to 0.5% (1 to 2 ppm) on regional scales every month. To verify the accuracy of the space-based XCO_2 data, the OCO-2 validation program will use ground-based, solar-viewing Fourier Transform Spectrometers (FTS) in the Total Carbon Column Observing Network (TCCON) to tie the space-based XCO_2 with the World Meteorological Organization (WMO) standard for atmospheric CO_2, which is based on in situ observations of CO_2 from flask measurements, tall towers, and aircraft.

In preparation for the OCO-2 mission, we are using the OCO-2 algorithm to retrieve XCO_2 from GOSAT measurements. We now retrieved XCO_2 from GOSAT data from April 2009 to present. These retrievals are being validated with the TCCON network.

This presentation will provide an overview of OCO-2 mission, including science objectives, instrument, algorithm, and validation plans as well as recent results from the GOSAT retrievals.