



The Orbiting Carbon Observatory (OCO-2) Mission and ACOS

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The NASA Orbiting Carbon Observatory (OCO-2) will make space-based measurements of atmospheric CO₂ with the precision, resolution, and coverage needed to characterize CO₂ sources and sinks on regional scales and quantify their variability over the seasonal cycle. After the failed launch of OCO, Congress instructed NASA to restart the OCO mission in the 2010 budget authorization. The OCO-2 mission will undergo review for authorization to proceed in early October 2010, and could be ready for launch into the Earth Observing System Afternoon Constellation (A-Train) in February 2013. The OCO-2 mission will be a 'carbon copy' of the OCO mission, to minimize schedule and cost risks.

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 CO₂ and molecular oxygen (O₂) absorption bands. These measurements will be combined to provide spatially resolved estimates of the column-averaged CO₂ dry air mole fraction, X_{CO₂}. The instrument collects 12 to 24 X_{CO₂} soundings/second over the sunlit portion of the orbit, yielding 200 to 400 soundings per degree of latitude, or 7 to 14 million soundings every 16 days. Thick clouds and aerosols will reduce the number of soundings available for X_{CO₂} retrievals by 80-90%, but the remaining data is expected to yield X_{CO₂} estimates with accuracies of ~0.3 to 0.5% (1 to 2 ppm) on regional scales every month. To verify the accuracy of the space-based X_{CO₂} 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 X_{CO₂} with the World Meteorological Organization (WMO) standard for atmospheric CO₂, which is based on in situ observations of CO₂ from flask measurements, tall towers, and aircraft.

In preparation for the OCO-2 mission, we are collaborating on the ACOS (Atmospheric Carbon Observations from Space) project. In the ACOS project, we are retrieving X_{CO₂} using the OCO-2 algorithm with the GOSAT measurements. We now have X_{CO₂} measurements from the Spring of 2009 to present, and they are being validated with the TCCON network.

This presentation will provide an overview of ACOS results and the OCO-2 mission, including science objectives, instrument, algorithm, and validation plans.