

THE ORBITING CARBON OBSERVATORY (OCO) MISSION

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The NASA Orbiting Carbon Observatory (OCO) 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. This Earth System Science Pathfinder (ESSP) mission will be launched in late 2008 and will fly in a 705 km altitude, 1:26 PM sun-synchronous polar orbit that provides near-global coverage of the sunlit hemisphere with a 16-day ground track repeat cycle. OCO carries 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_{CO_2} . The instrument collects 12 to 24 X_{CO_2} 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_{CO_2} retrievals by 80-90%, but the remaining data is expected to yield X_{CO_2} 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_{CO_2} data, the OCO 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_{CO_2} 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.