The Orbiting Carbon Observatory Development Status

D. Crisp and the OCO Team

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The Orbiting Carbon Observatory (OCO) is currently under development at the Jet Propulsion Laboratory, in preparation for a launch in December of 2008. This NASA Earth System Science Pathfinder (ESSP) mission will make global, space-based measurements of atmospheric carbon dioxide (CO_2) with the precision, resolution, and coverage needed to characterize CO_2 sources and sinks on regional scales. The Observatory consists of a dedicated spacecraft bus that carries a 3-channel, high resolution grating spectrometer. The column averaged CO_2 dry air mole fraction, X_{CO2} will be retrieved from coincident high resolution spectroscopic measurements of reflected sunlight in near-infrared CO_2 and molecular oxygen (O_2) bands. The instrument has recently completed its pre-launch testing and calibration in preparation for integration with the spacecraft bus. OCO will be launched from Vandenberg Air Force Base and will join the Earth Observing System Afternoon Constellation (A-Train) about 45 days later. This group of satellites files in a 98.8 minute, 705 km altitude, sun-synchronous orbit with a 16 day ground track repeat cycle. OCO will fly at the head of the A-Train with an ascending nodal crossing time of ~1:26 PM. Routine science operations are expected to begin in February of 2009. The OCO science data will be transmitted to the NASA Ground Network Stations in Alaska and Virginia, and then transferred to the OCO Ground Data System at JPL. There, the CO_2 and O_2 spectra will be analyzed by the OCO Science Team to retrieve spatially resolved estimates X_{CO2}. Calibrated, geolocated spectral radiances will be archived in a NASA Distributed Active Archive Center (DAAC) starting in the late summer of 2009. About 3 months later, an exploratory X_{CO2} product will start being delivered to the DAAC. These data will be validated against existing ground- and tower-based measurements using high resolution Fourier transform spectrometers (FTS's) from the Total Carbon Column Observing Network (TCCON) as the transfer standard (Figure 1).

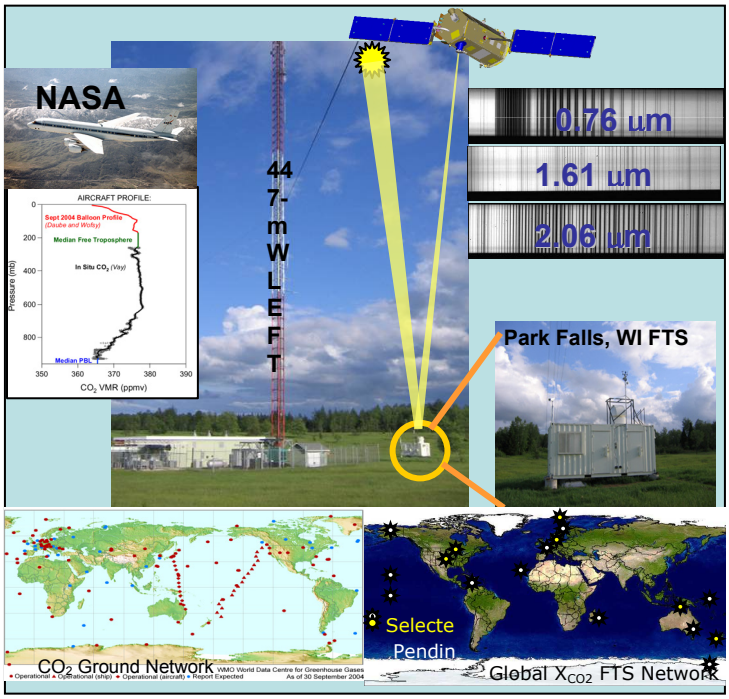

Figure 1. The OCO validation approach. OCO will acquire measurements over a TCCON FTS site roughly once each day. These FTSs measure X_{CO2} using the same spectral bands used by the flight instrument, but provide ~10 times the spectral resolution, and substantially greater signal-to-noise ratios. They are also relatively insensitive to optical Pathlength biases from cloud and aerosol scattering. X_{CO2} data from the TCCON sites at Park Falls, Wisconsin (shown) and Darwin, Australia have been validated against in-situ data collected by aircraft and balloons. Additional validation activities will be conducted during the operational phase of the mission.