Watching the Earth breathe.... mapping CO2 from space.

Orbiting Carbon Observatory

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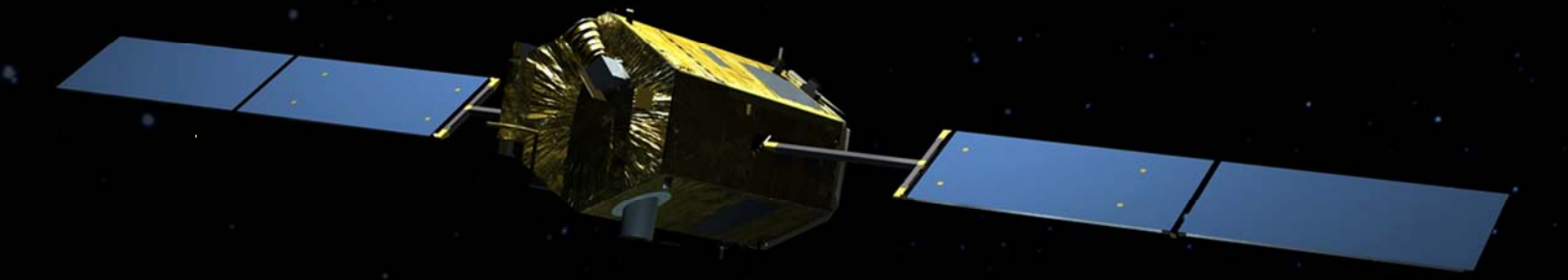
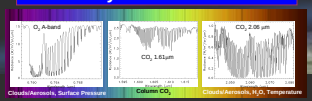
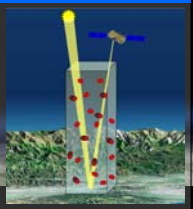
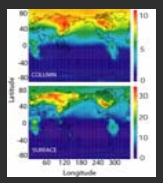


OCO Science

OCO will acquire the space-based data needed to identify CO_2 sources and sinks and quantify their variability over the seasonal cycle







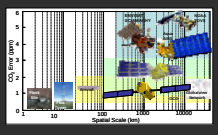
Approach:

- Collect spatially resolved, high resolution spectroscopic observations of CO_2 and O_2 absorption in reflected sunlight
- Use these data to resolve spatial and temporal variations in the *column averaged CO_2 dry air mole fraction, X_{CO2}* over the sunlit hemisphere
- Employ independent calibration and validation approaches to produce X_{CO2} estimates with random errors and biases no larger than 1 - 2 ppm (0.3 - 0.5%) on regional scales at monthly intervals

Column Abundance
Path Dependent

Ratio

X_{CO2}
Path Independent Mixing Ratio



OCO Fills a Critical Measurement Gap

OCO will collect space-based measurements of atmospheric CO_2 with the precision, resolution, and coverage needed to characterize its sources and sinks on regional scales and quantify their variability over the seasonal cycle.

OCO files at the head of the A-Train, 4 minutes ahead of the Aqua platform

- A 1:26 PM equator crossing time yields same ground track as AQUA
- Near noon orbit yields high SNR CO_2 and O_2 measurements in reflected sunlight
- CO_2 concentrations are near their diurnally-averaged values near noon
- Maximizes opportunities of coordinated science and calibration activities

Mission Overview

JPL Project Team
- Science & Project Team
- Systems Engineering, Mission Assurance
- Ground Data System

Single Instrument (Hamilton Sundstrand)
- Incorporates 3 high resolution spectrometers

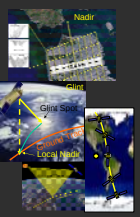
Dedicated Bus (Orbital LEOStar-2)
- Heritage: OrbView 4, GALEX, SORCE

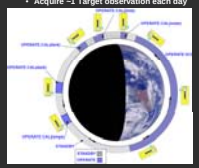
Dedicated Launch Vehicle
- Orbital Sciences Taurus 2110 launch system
  - Standard 63-inch fairing
  - Soft Ride Adapter (Vibration Damper)
  - September 2008 Launch from Vandenberg

Mission Operations (JPL/Orbital)
- High latitude station for downlink station

INSTRUMENT
- Three bore-sighted, high resolution, grating spectrometers
  - CO_2 1.61 μm band
  - CO_2 2.06 μm band
  - O_2 0.765 μm A-band
- Similar optics and electronics
  - Common telescope
  - Resolving Power ~20,000

SCIENCE OBSERVING MODES
- Nadir Observations: tracks local nadir
  - + Small footprint (< 3 km²) isolates cloud-free scenes and reduces biases from spatial inhomogeneities over land
  - - Low Signal/Noise over dark ocean
- Glint Observations: views "glint" spot
  - + Improves Signal/Noise over oceans
  - - More interference from clouds
- Target Observations
  - Tracks a stationary surface calibration site to collect large numbers of soundings
- Data acquisition schedule:
  - Alternate between Nadir and Glint on 16-day global sampling repeat cycles
  - Acquire ~1 Target observation each day





PER ORBIT CALIBRATION SEQUENCE

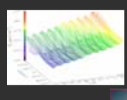
Calibration data
- Cal_solar, Cal_limb: solar observations using the OBC diffuser screen. Provides radiometric absolute and channel-relative adjustments and wavelength determination.
- Cal_lamp: Provides pixel-relative adjustments (flat field).
- Cal_dark: Provides offset.

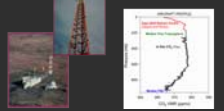
Science_nadir data
- Earth_statistics: Statistics are reported on a per-granule basis. Used to update OBC lamp radiance profile.
- Sahara_targets: Monitor stability of OBC diffuse transmittance.

Validating OCO Data

A rigorous validation approach will speed acceptance of OCO data by the Science Community

- The space-based measurements must be validated against the surface CO_2 standard





Current Status

- Sep 2007: Successfully completed first thermal vacuum test of instrument
- Dec 07 – Feb 08: Instrument pre-flight characterization and calibration testing
- Spacecraft on schedule for March 2008 delivery and Observatory integration
- On schedule for December 2008 launch