Committee on Earth Observation Satellites

GeoCarb Status and Plans

Report to CEOS AC-VC

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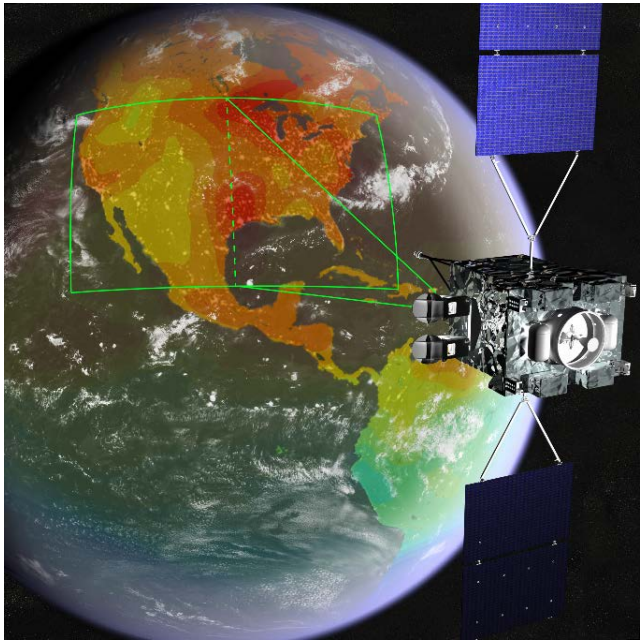
The GeoCarb Mission

- In December of 2016, NASA selected the Geostationary Carbon Cycle Observatory (GeoCarb) as the second space-based investigation in the Earth Venture Mission series
- GeoCarb is the first NASA satellite designed to collect spatially resolved observations of the column averaged mole fractions of carbon dioxide (CO_2), methane (CH_4), and carbon monoxide (CO), and solar induced chlorophyll fluorescence (SIF) from geostationary orbit (GEO)
- The GeoCarb instrument will be hosted on a SES Government Solutions satellite in GEO orbit above 85° West longitude
- From this vantage point, the GeoCarb instrument will produce maps of the column averaged dry air mixing ratios of CO_2 (X_{CO2}), CH_4, (X_{CH4}), CO (X_{CO}) and SIF at a spatial resolution of 5-10 km multiple times each day

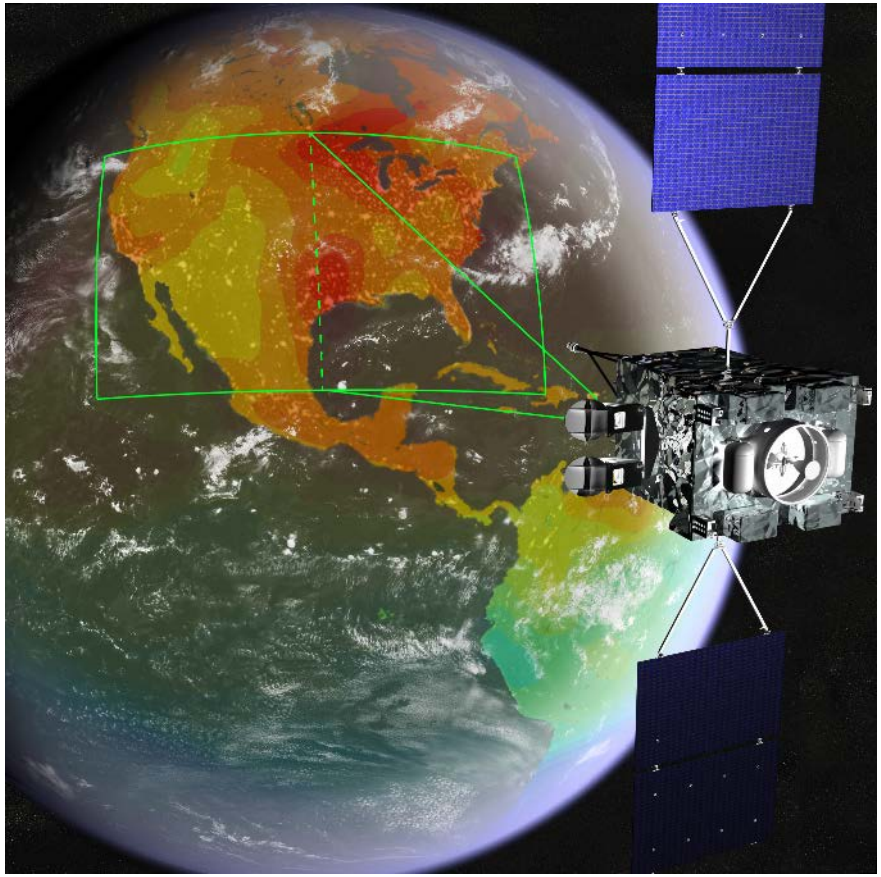
Why Geostationary Orbit?

- Atmospheric Trace Gases are a combination of emissions from the surface and the motions of the atmosphere. Teasing these influences apart requires lots of observations.
- Polar orbiting satellites can have long revisit times and large gaps in coverage. For cloudy regions like the Amazon, entire seasons can pass with no observations.
- Infrequent observations are hard to connect to emissions at regional scales.
- Weather affects ecosystems on the time scale of days to weeks, meaning that polar orbiters may miss ecosystem transitions due to dramatic changes in weather patterns, such as flash drought or persistent heavy rains.



- Anthropogenic sources are concentrated in small areas relative to natural processes, which makes them even harder to detect and differentiate from biogenic emissions with current observing systems.

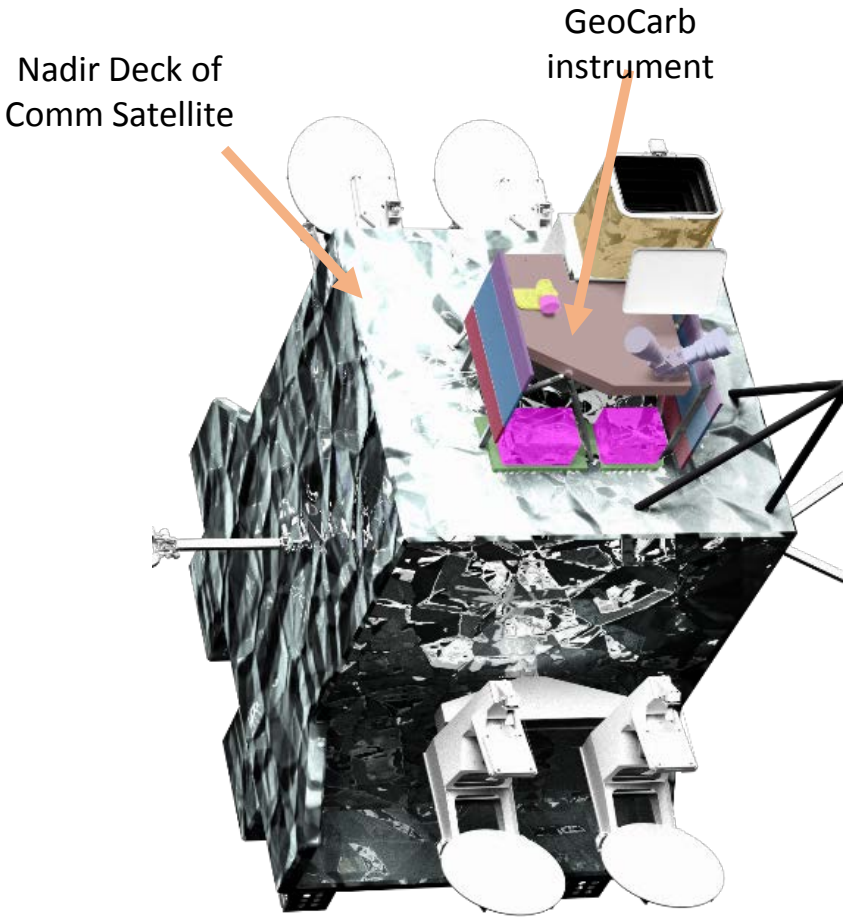
The GeoCarb Mission

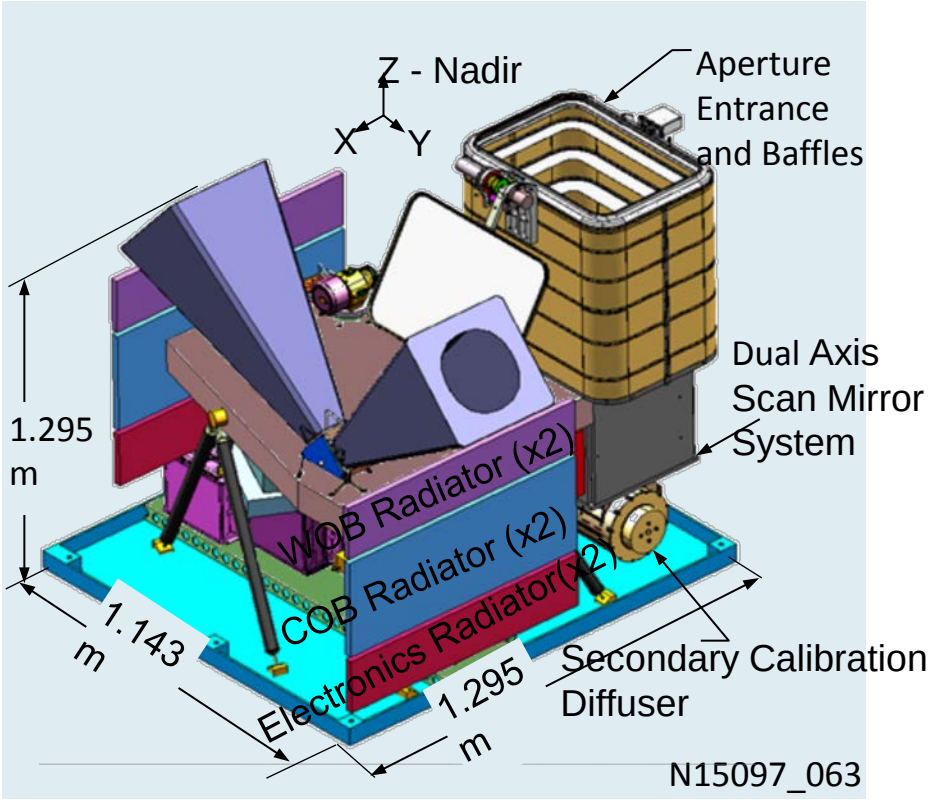


Principal Investigator	Berrien Moore, University of Oklahoma
Technology Development	Lockheed Martin Advanced Technology Center
Host Spacecraft & Mission Ops	SSE Government Solutions

Instrument	Single slit, 4-Channel IR Scanning Littrow Spectrometer
Bands	0.76μm, 1.61μm, 2.06μm and 2.32μm
Gases	O_2, CO_2, CO, CH_4 & Solar Induced Fluorescence
Mass	138 kg (CBE)
Dimensions	1.3 m x 1.14 m x 1.3 m
Power	128W (CBE)
Data Rate	10 Mbps
Daily Soundings	~10,000,000 soundings per day CONUS > once per day

GeoCarb Instrument





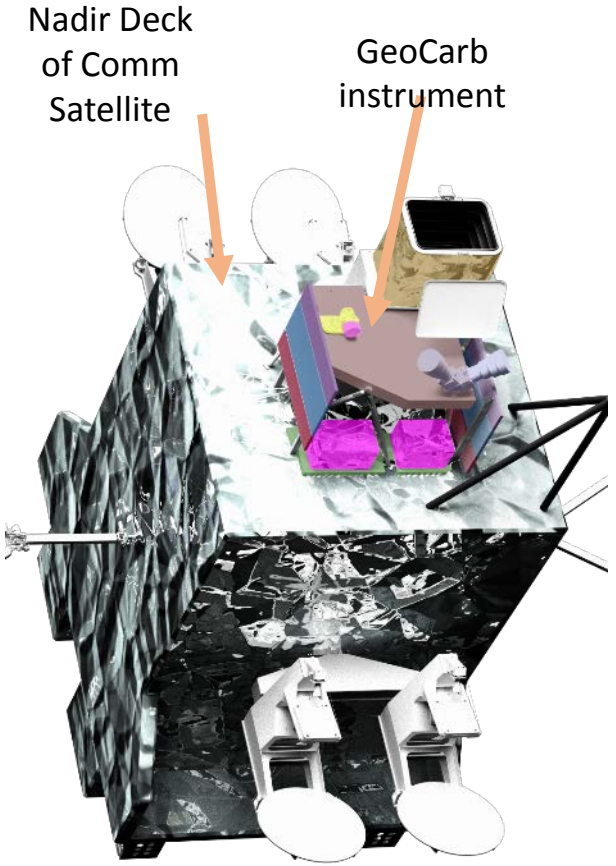
GeoCarb is Hosted on a SES Commercial Communications Satellite

Access to a geostationary platform provides persistent views of CONUS and western hemisphere to accomplish science objectives

Commercial spacecraft provides economical access to Geo Orbit

A communications satellite can easily accommodate the mass, telemetry and power of an earth looking science mission

Benefits from existing infrastructure for command and control and mission data delivery



Instrument and Host Status

- Instrument
  - Preparing for SRR – 1-2, August 2017
  - Building LW channel testbed for TRL 6 demonstration
  - Working to establish Teledyne subcontract for H1RG wafer fabrication
  - Reviewed optical design for SIF and baselined original proposal design
- Host Spacecraft
  - SES accommodation study contract working interfaces
    - proceeding well
  - Satellite vendor will be selected at program CDR
  - Slated for 85º W slot
- Launch Readiness Date – 3rd quarter of 2021
  - Followed by an orbit-raise maneuver that may last for several months
  - Expected start of operations – 2nd quarter of 2023