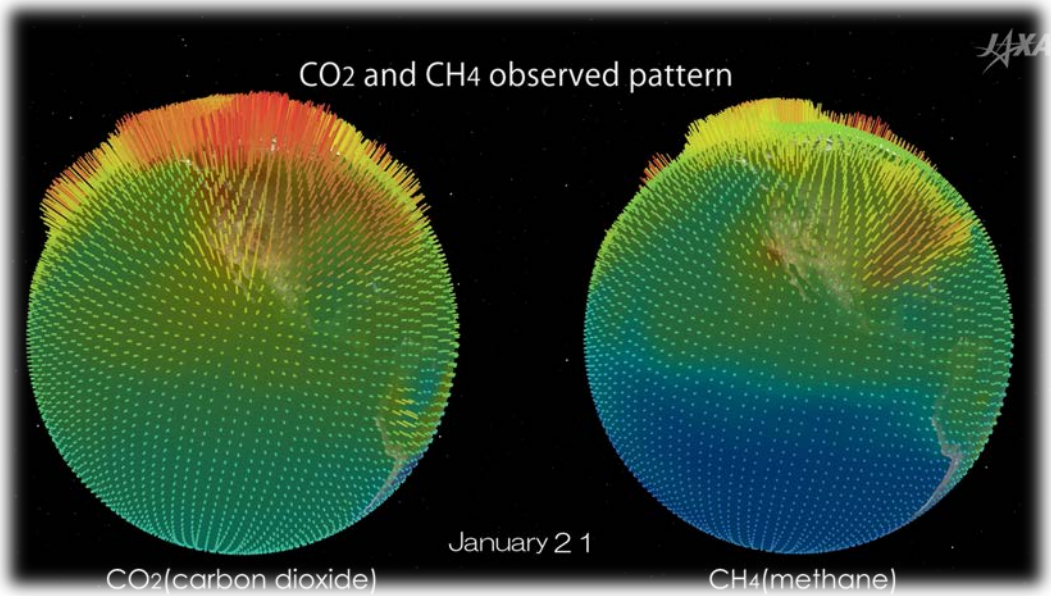
CEOS AC-VC

GOSAT update

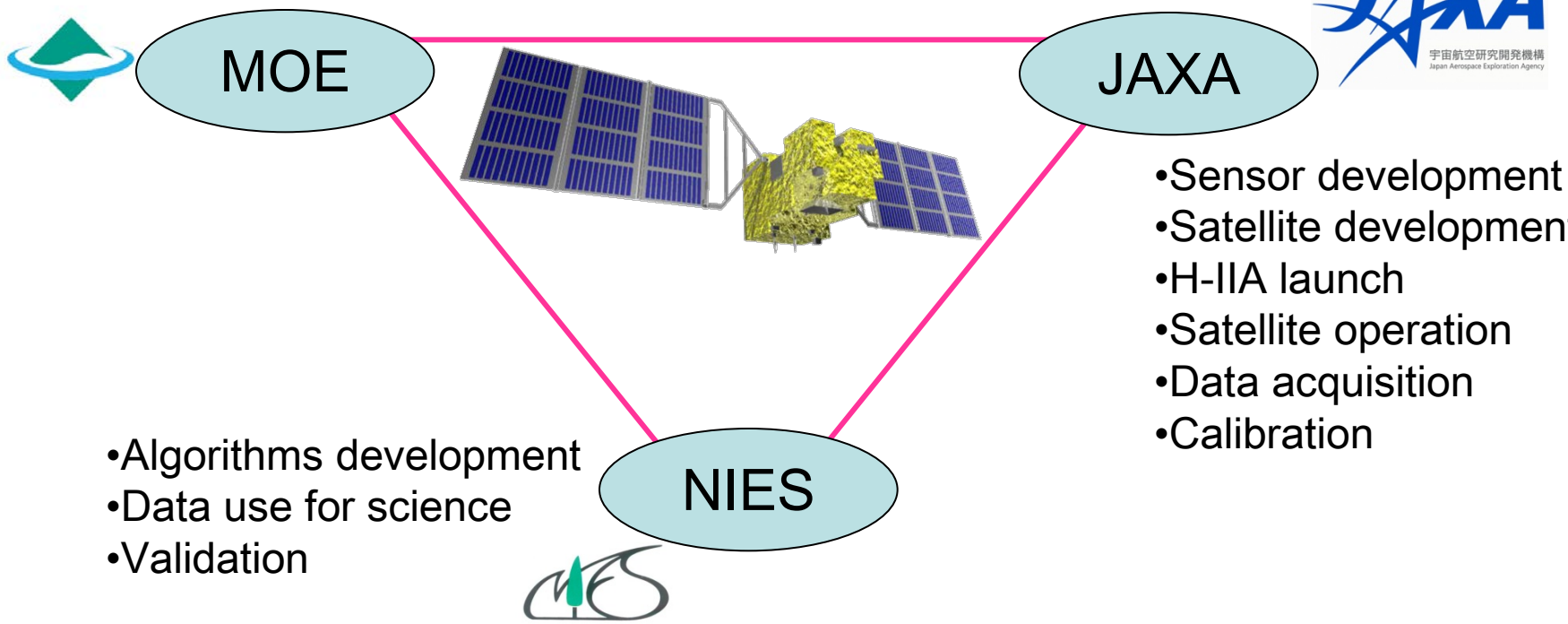


June
Prepared by JAXA EORC
Presented by David Crisp

GOSAT & GOSAT-2 Organization

ORGANIZATION

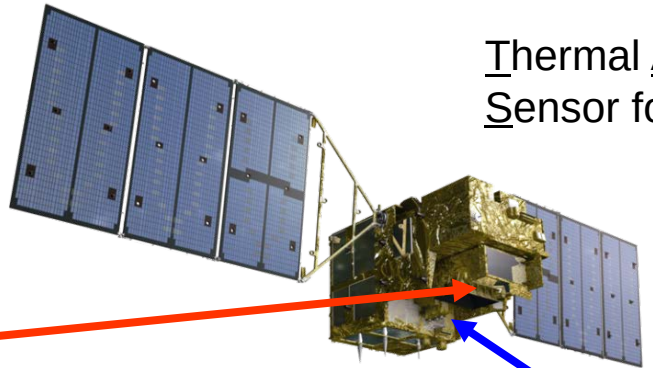
GOSAT is the joint project of JAXA, MOE (Ministry of the Environment) and NIES (National Institute for Environmental Studies).



Launch Vehicle and orbit
GOSAT Satellite Configuration

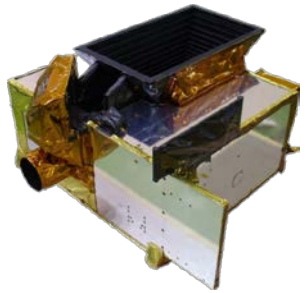
Size	Main body	3.7m(H) x1.8m(W) x 2.0m(D)(Except attachment)
	Wing Span	13.7 m
Mass	Total	1,750 kg
Power	Total	3.8KW(EOL)
Design Life	5 years	
Orbit	Sun Synchronous Orbit	
	Local time	13:00±0:15 (February 2015 - January 2016) 12:46-12:52
	Altitude, inclination, period, revisit	666±0.6 km, 98.0±0.1 deg, 98.1 min, 3 days (44 rotations)
Launch	Vehicle, date	H-IIA, Jan. 23, 2009

One of the two solar paddles stopped its rotation. (June 2014)



Thermal And Near infrared Sensor for carbon Observation

TANSO-FTS



SWIR/TIR FTS

TANSO-CAI

UV, Visible, SWIR Imager

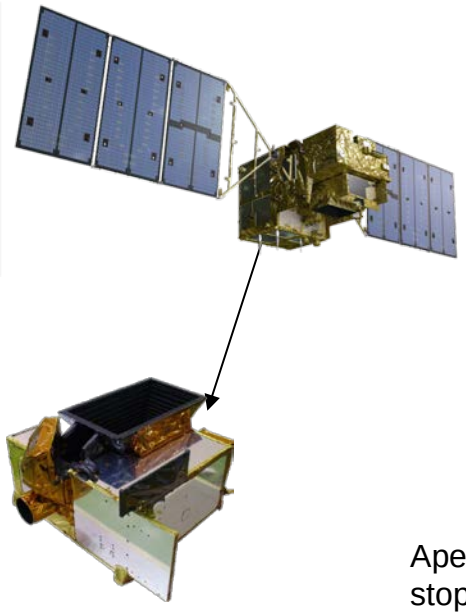
(1) Metrology alignment changed
> ZPD (Zero Path Difference) -position Biased interferogram (2014)

(2) Pointing mechanism switched (2015)

Healthy

FTS Optics Layout

FTS multiplex advantage: exact the same IFOV: SWIR, TIR, 2 linear polarization



CMOS Camera 1296 by 1040 pixels

Scene flux from nadir

Deep space view

Black body view

Diffused solar flux

Pointing and image motion compensation

Primary System

Secondary System

with the secondary pointing system since Jan. 26, 2015
Much better than the primary

Aperture stop (Cube Corner)

Collecting mirror

Field stop

DF1

DF2

DF3

Collimating mirror

BPF1

BPF2

BPF3

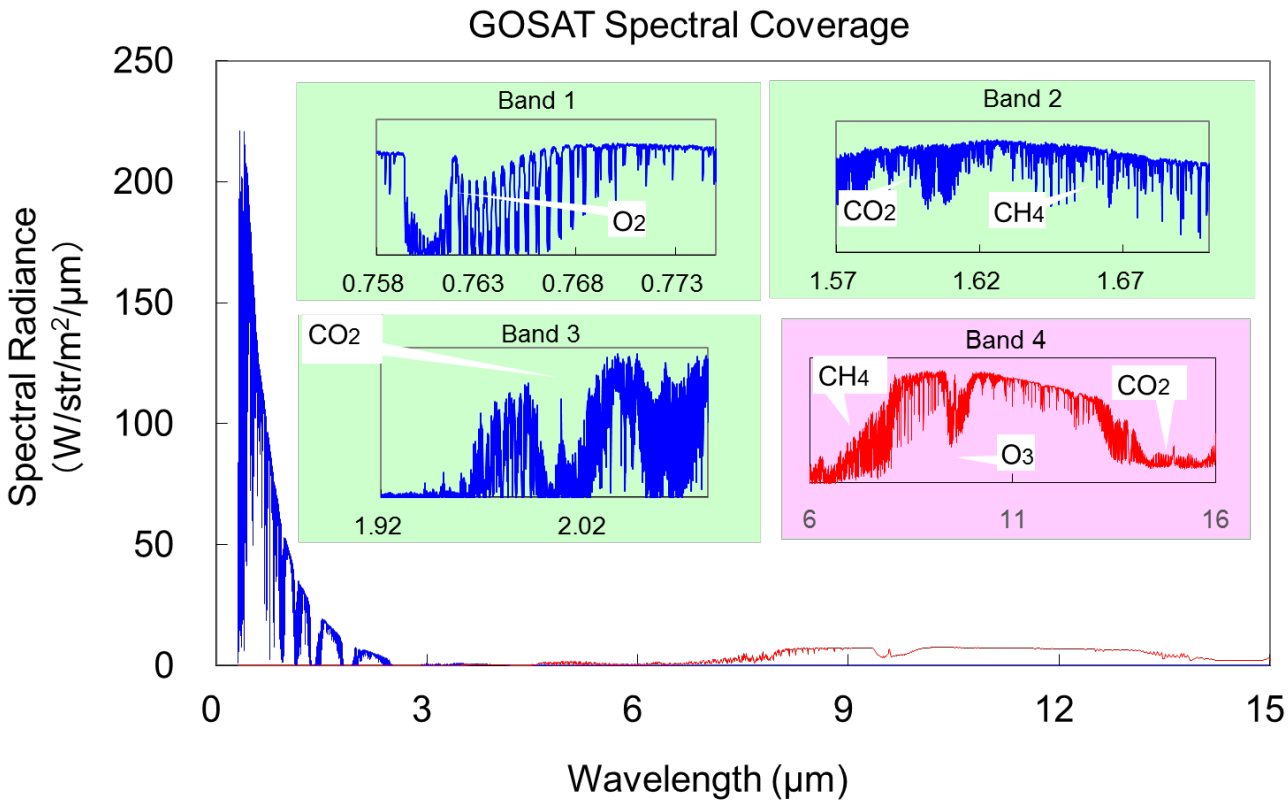
MCT(B4) on Dewar and Pulse Tube Cooler

InGaAs with TE cooler (B3) P,S

Si (B1)P,S

InGaAs with TE cooler (B2) P,S

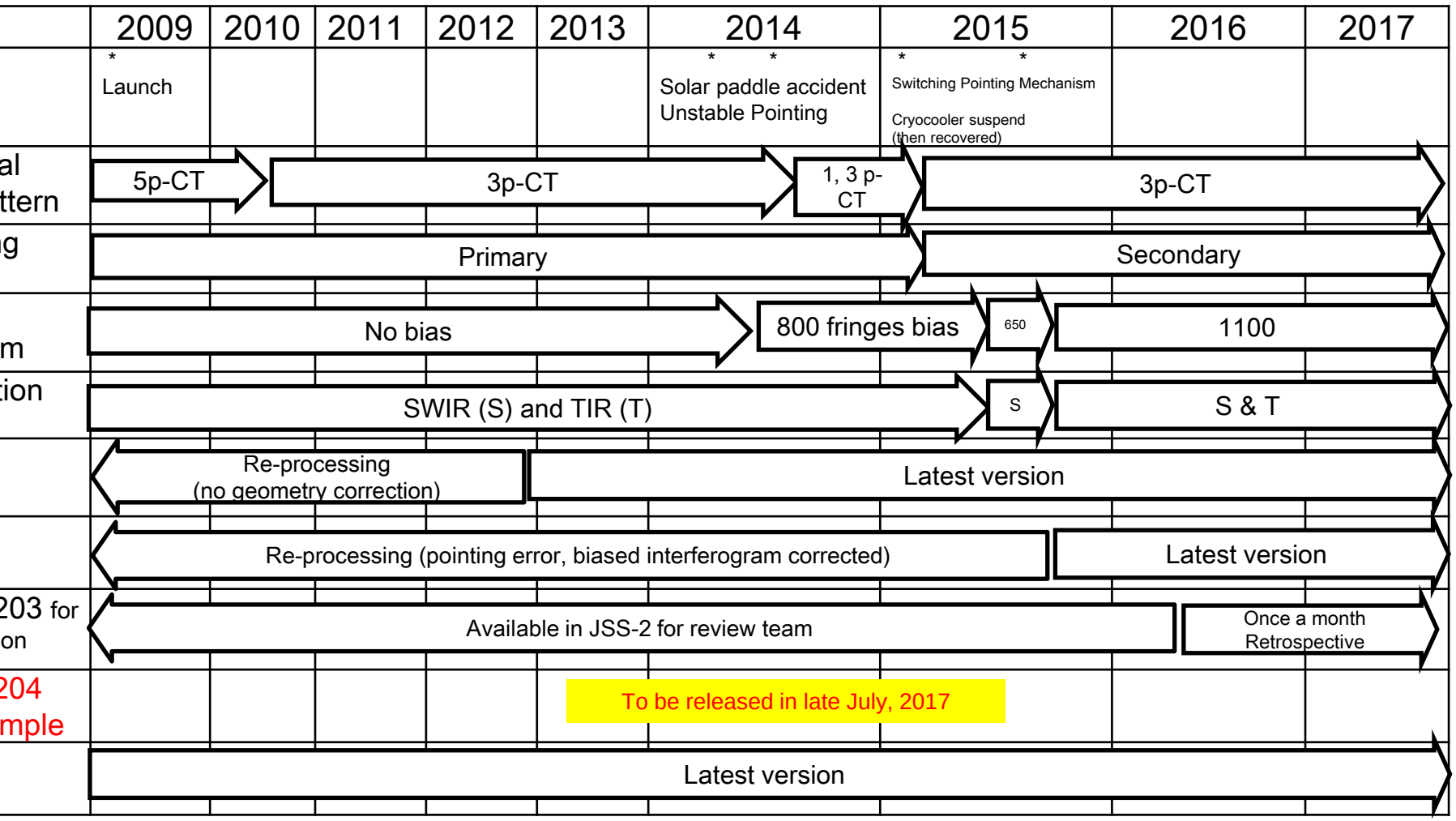
Wide Spectral Coverage with a FTS



- 3 narrow bands
  - 0.76 μm
  - 1.6 μm
  - 2.0 μm
- A wide band
  - 5.5 – 14.3 μm
- With 0.2cm^{-1} spectral resolution (interval)

- Column averaged density of CO_2 is mainly retrieved by using the absorption lines between 1.6 μm region.
  - The intensities of these lines are less temperature dependent and not interfered by other molecules.
- O_2 A band absorption at 0.76 μm: Dry air column

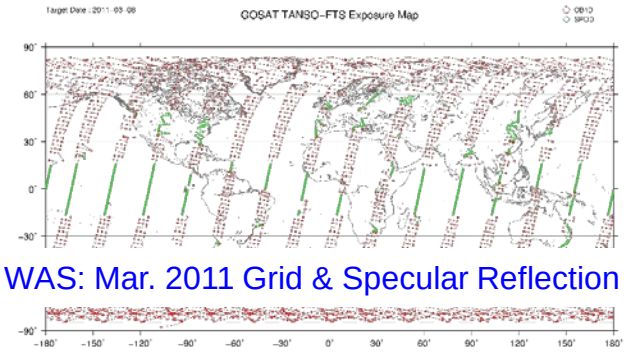
GOSAT 8-year operation



Lunar calibration after the 2014 solar paddle accident has been canceled.
Orbit control scheduled in 2016 summer has been postponed. Local time is shifting from 12:48 toward 13:00.

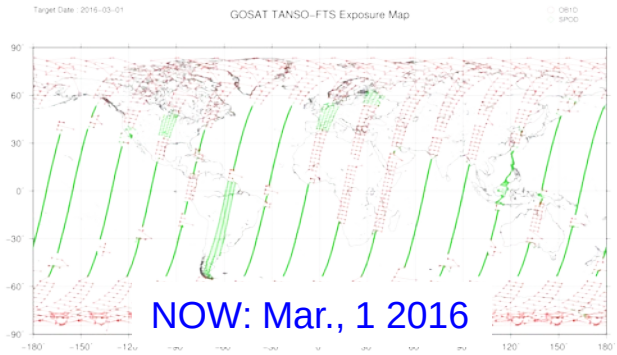
Flexibility with Target Observation

Optimized sampling pattern for flux estimation with an agile pointing system

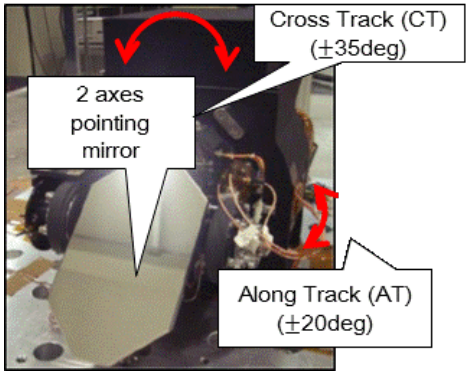


WAS: Mar. 2011 Grid & Specular Reflection

Extending glint region over ocean by tracking principal plane

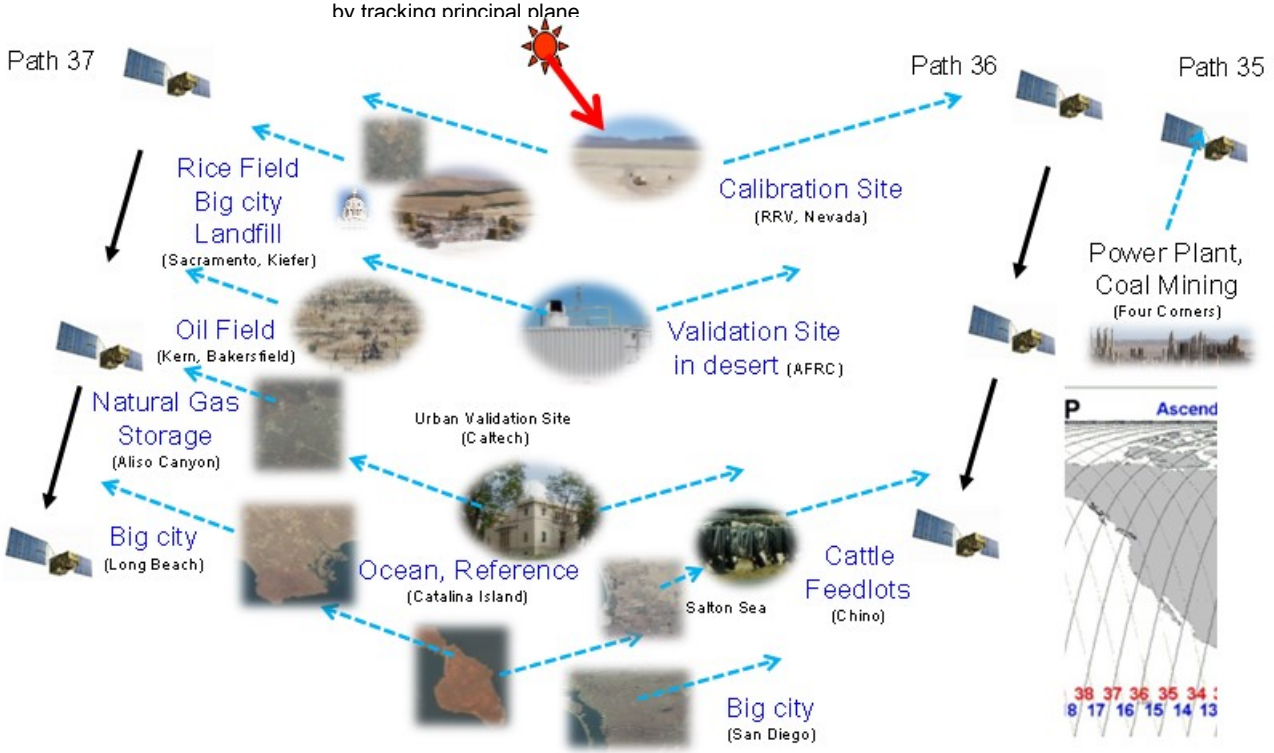


NOW: Mar., 1 2016



2-Axis pointing system

Up to 1000 custom target observations per day by uploading commands every day.



GHG Trend Viewer and NASA GES DISC

CMS (Carbon Monitoring System) Methane (CH_4) Flux for North America 0.5 degree x 0.667 degree

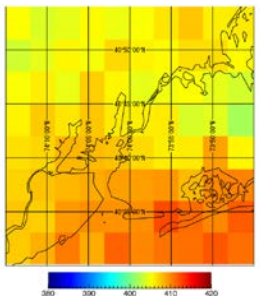
Contents

Long term

CO_2, CH_4, SIF, AOD

Solar-induced chlorophyll fluorescence

Aerosol optical depth



To be added

City distribution map

Aeronet site

4 Level 2 products intercomparison

OCO-2 match up

Surface wind speed

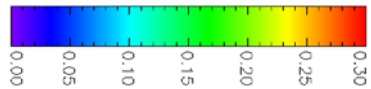
Ground validation data

NASA GES DISC

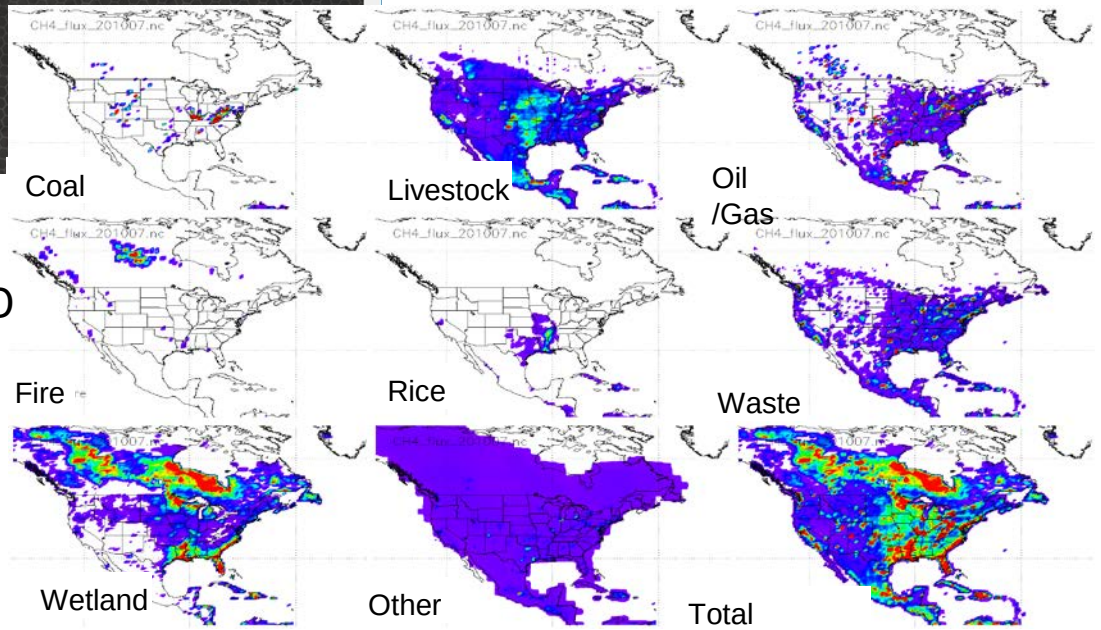
The CMS Methane (CH_4) Flux for North America data set contains estimates in North America based on an inversion of the GEOS-Chem chemical transport model constrained by GOSAT.

July 2010

https://mirador.gsfc.nasa.gov/



CH_4 emission (Gg/year)



Toward GHG satellites constellation

Inter-comparison between GOSAT and OCO-2

2008 2009 2010 2011 2012 2013 2014 2015 2016 2017

Radiometric calibration

Prelaunch X-CAL

Annual Vicarious Calibration at the desert playa in Nevada

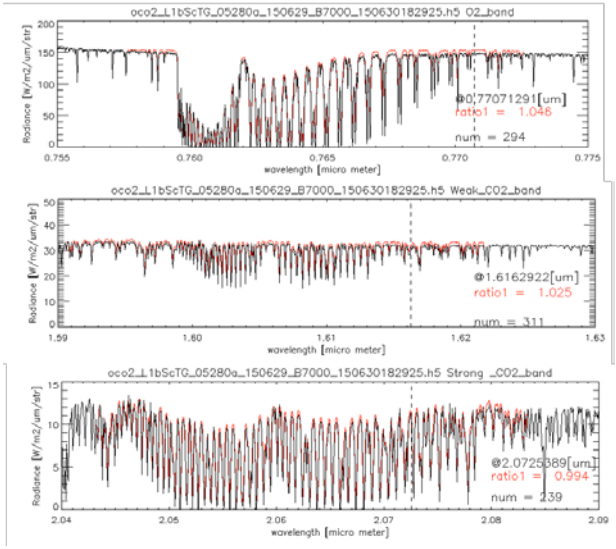
CO_2 & CH_4 profile

In situ CO_2 and CH_4 on NASA AMES AJAX

XCO_2 & XCH_4

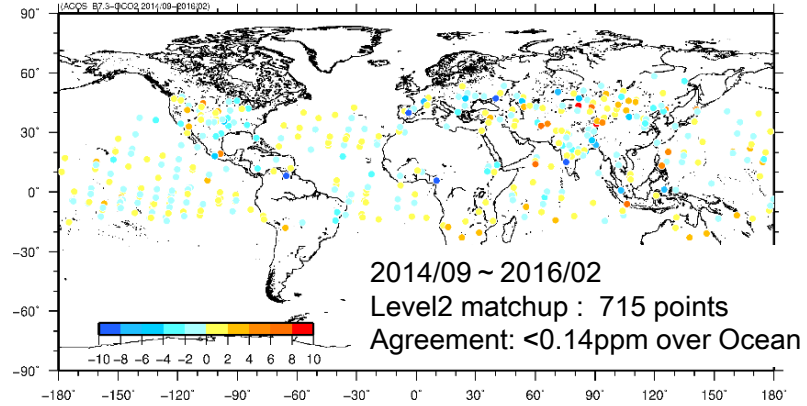
Column with a compact FTS

GOSAT
OCO-2



Calibrated GOSAT and OCO-2 radiance spectra agrees within 5% for all bands.

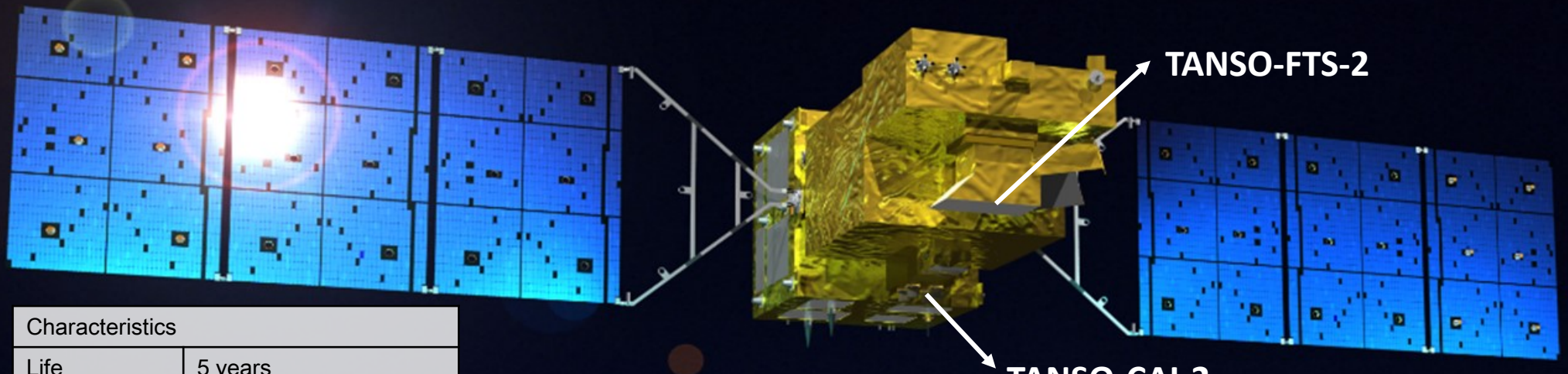
Coincident Target



Retrieved Parameter Comparison over match up points

Next
Coincident flight with Charm-F
Intercomparison with TANSAT

GOSAT-2



Characteristics	
Life	5 years
Orbit	Sun-Synchronous (628km)
Mass	About 2 t
Launch	FY 2018
Observation Valuables	CO_2, CH_4 and CO Accuracy: 0.5 ppm (CO_2) and 5 ppb (CH_4) at 500-km mesh over earth's surface

1. **Simultaneous CO (carbon monoxide) measurement**
2. **All target mode capability**
3. **Cloud-avoiding pointing with onboard camera**

TANSO-FTS-2

	Band 1	Band 2	Band 3	Band 4	Band 5
Target Gases	O_2	CO_2, H_20	CO_2, CH_4, CO, H_20		
Spectral Coverage (μm)	0.75-0.77	1.56-1.69	1.92-2.33	5.5-8.4	8.4-14.3
Spectral Coverage (cm-1)	12,950 - 13,250	5,900 - 6,400	4,200 - 5,200	1,188 - 1,800	700 - 1,188
Spectral Resolution	0.2 cm^{-1}				
Exposure	4 sec				
IFOV	9.7 km				
Pointing	±40 deg. (Along track), ±35 deg. (Cross track)				
Polarimetry	Yes (P and S channels)			No	

TANSO-CAI-2 (radiometer)

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Spectral Band (nm)	333 - 353	433 - 453	664 - 684	859 - 879	1585 - 1675	370 - 390	540 - 560	664 - 684	859 - 879	1585 - 1675
Tilt	+20 deg. (Forward viewing)					-20 deg. (Backward viewing)				
Spatial Resolution	460 m				920m	460 m				920m
Swath	920 km									