

# GOSAT Calibration Updates and Operations toward an Optimized Observation Pattern



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**Toronto**

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# Today's Talk

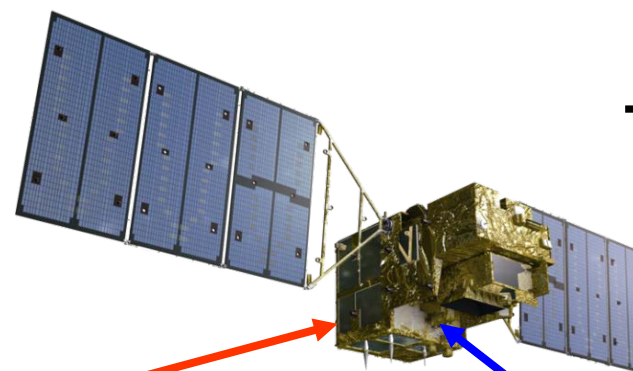
- (1) Newly released TANSO-FTS Level 1 V210
- (2) GOSAT condition in orbit & 2018 plan
- (3) GOSAT trend viewer
- (4) Score map

Thermal And Near infrared  
Sensor for carbon Observation

## TANSO-CAI

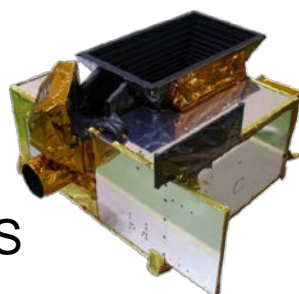
UV, Visible, SWIR Imager

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



## TANSO-FTS

SWIR/TIR FTS



- (1) Metrology alignment changed  
ZPD (Zero Path Difference) -position Biased interferogram (2014)
- (2) Pointing mechanism switched (2015)

Healthy



# Operation Summary

TANSO-FTS-Level 1, Both V201.202 and V210.210 are provided

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018-
Milestone	* Launch					* Solar paddle accident Unstable Pointing	* Switching Pointing mechanism Cryocooler suspend			
FTS Nominal Pointing Pattern	5p-CT	3p-CT				1, 3 p-CT	3p-CT			
FTS Pointing Mechanism	Primary					Secondary				
FTS interferogram	No bias					800 fringes bias	650	1100		
FTS Operation	SWIR (S) and TIR (T)						S	S & T		
FTS L1B V161.161	Re-processing (no geometry correction)				Old version					
FTSL1B V201.202	Re-processing (pointing error, biased interferogram corrected)						Older version			
<b>FTSL1B V210.210</b>	<b>Re-processing (completed)</b>									
CAI L1A V130.131	Latest version									

Operational

Operational

Operational



# Newly-Released TANSO-FTS Level 1 V210 dataset

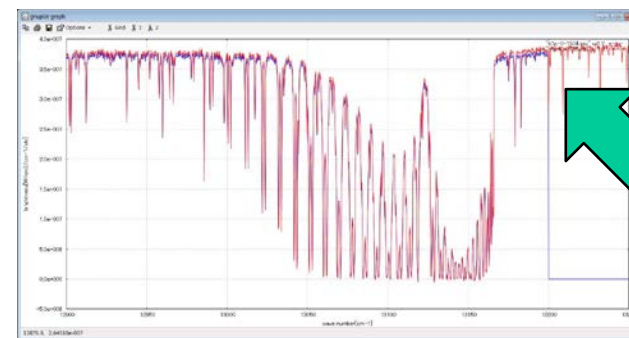
Released March, 2018

Reprocessing of 9 year dataset was completed in April 27.

1. Update: nonlinearity correction of the TIR band ([major updates](#))
2. O<sub>2</sub>A band Extension from 13200 cm<sup>-1</sup> to 13250 cm<sup>-1</sup> for SIF
3. Update: Radiance conversion table by reprocessing prelaunch integrating sphere data
4. Glint Flag (was specular reflection only)
5. Master quality flags (was too strict for pointing and FTS timing mismatch)
6. Modification: over-corrected non-linearity correction of very bright O<sub>2</sub>A such as thick clouds

$$V_{Pamp} = - \left( \frac{(V_{DC} - V_{DCoffset}(t))}{g_{DC}} \right) - \frac{V_{AC}}{g_{AC}}$$

$$V_{NLcorrected} = V_{Pamp} + a_{nlc} V_{Pamp}^2$$

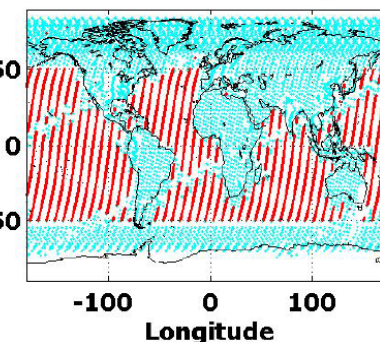
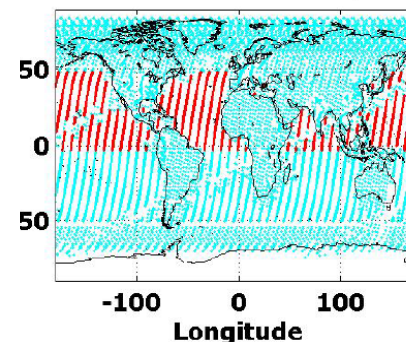


V201  
V210

V201 20150619-21 Dayside

→

V210 20150619-21 Dayside

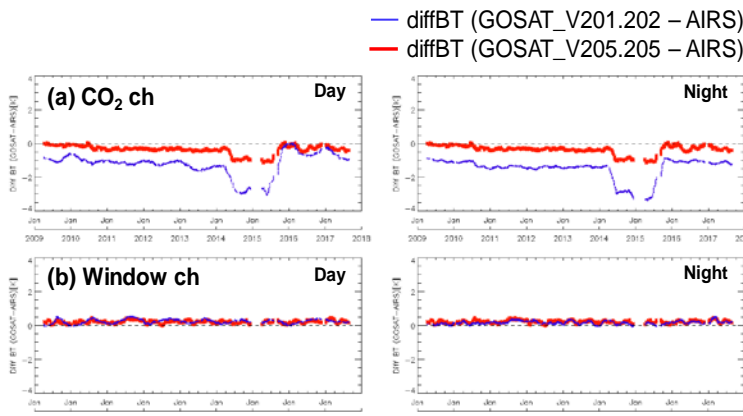




# What is gained from the V210 TIR

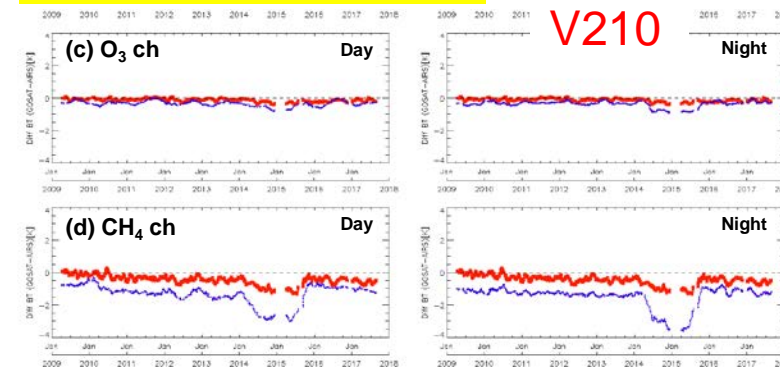
## A. Seamless calibrated dataset

The new dataset exhibits seamless radiometric calibration before and after cryo-cooler anomalies in May 2014 and August 2015.

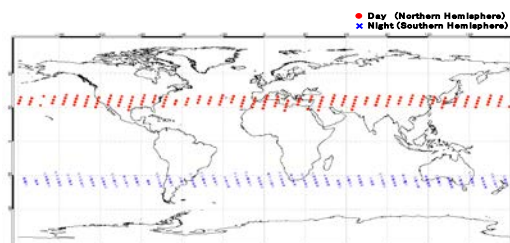


Kataoka et al, (submitted)

V201  
V210

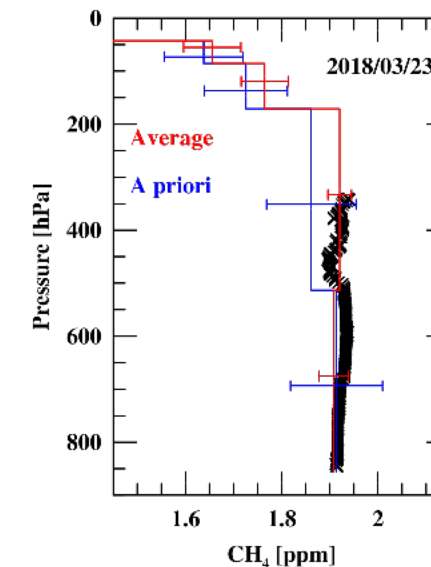
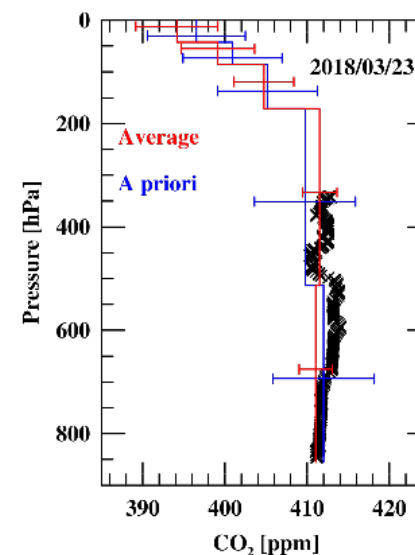


Was too cold in CO<sub>2</sub> and CH<sub>4</sub> band  
Was too hot for hot target in window



## B. Partial column product of lower and upper troposphere (LT, UT) from simultaneous use of SWIR and TIR

Now Full use of both SWIR and TIR  
Minimizing the retrieved parameter for robustness: only two layers in troposphere



Kikuchi's Poster

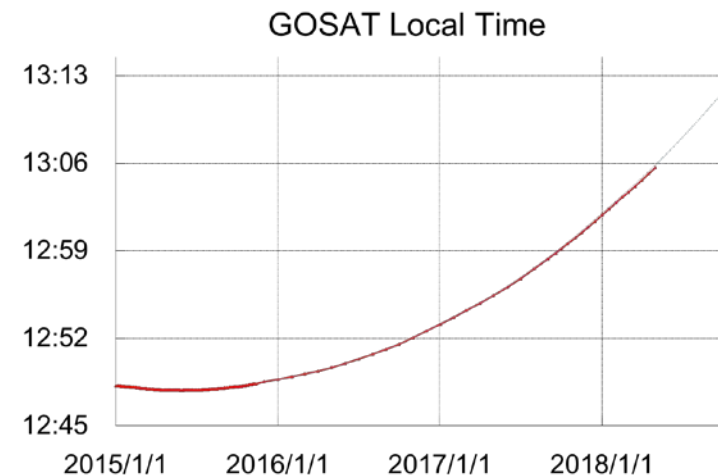
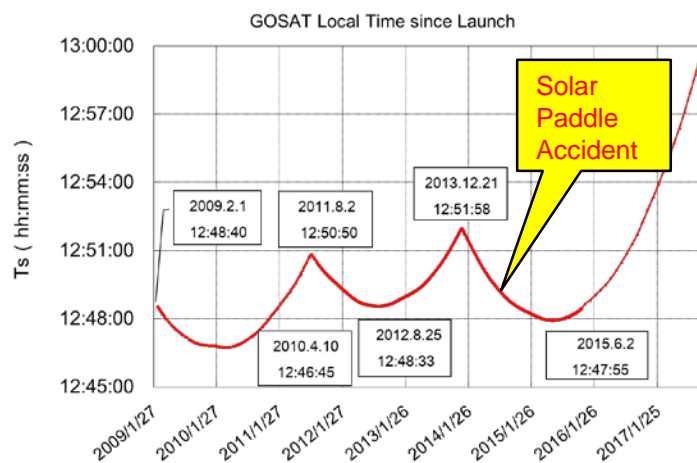
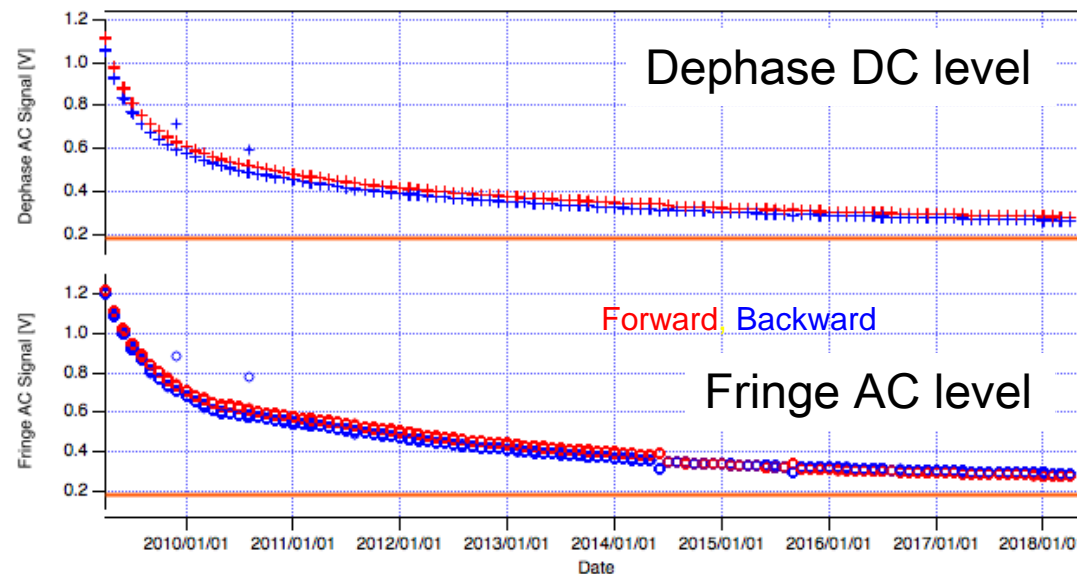


# How many more years can GOSAT Operate? 2018 Operation Plan

- (1) Healthy 4 batteries (low depth of discharge) at least 5 more years.
- (2) Enough fuel for attitude control.
- (3) Laser level for FTS mechanics is still above the critical level

A. June 21-10<sup>th</sup> OCO-2 GOSAT joint vicarious calibration campaign at Railroad Valley, NV

B. July 15-3<sup>rd</sup> inclination maneuvering control  
No target observation during this period.





# A decade long dataset and new research products

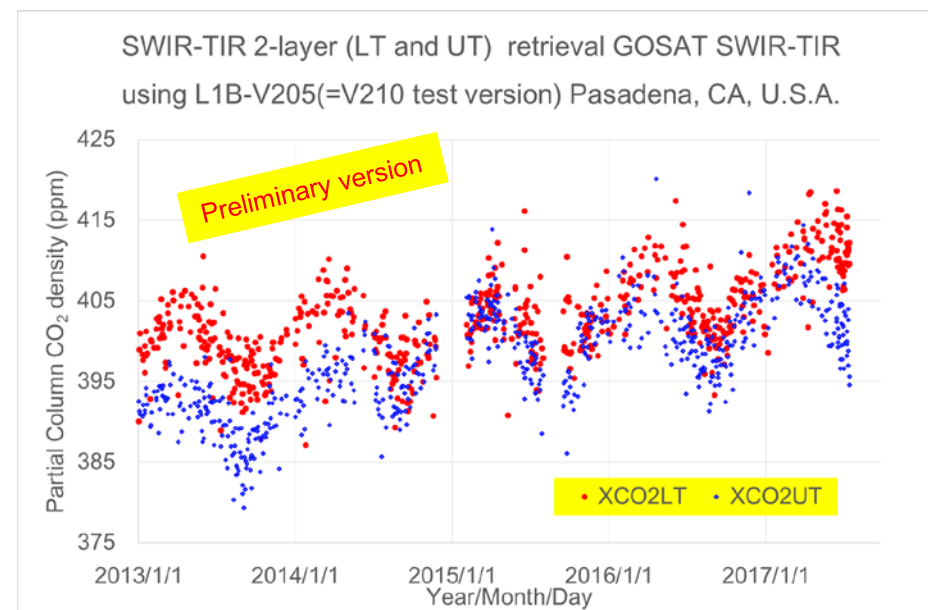
<http://www.eorc.jaxa.jp/GOSAT/product.html#trendviewer>

long-term trend data of the selected targets, including the large point sources of methane ( $\text{CH}_4$ ) and intensive observations of selected mega cities.

- Contents: Long term  $\text{CO}_2$ ,  $\text{CH}_4$ , SIF, AOD by GOSAT
  - 3 produces : NIES V02.72, ACOS B7.3 FULL, RemoTeC V2.3.8
  - Trend figure & can be downloaded in csv format
- Solar-Induced chlorophyll Fluorescence (SIF), Aerosol Optical Depth (AOD), Population density

## Plan for 2018

Long term research product of partial column and SIF of selected targets: Mega cities, CAL&VAL, point source





# Toward Optimizing Observation Pattern

GOSAT-II observation pattern can be fully customized. GOSAT has up to 1,000 target observation per day in addition to glint.

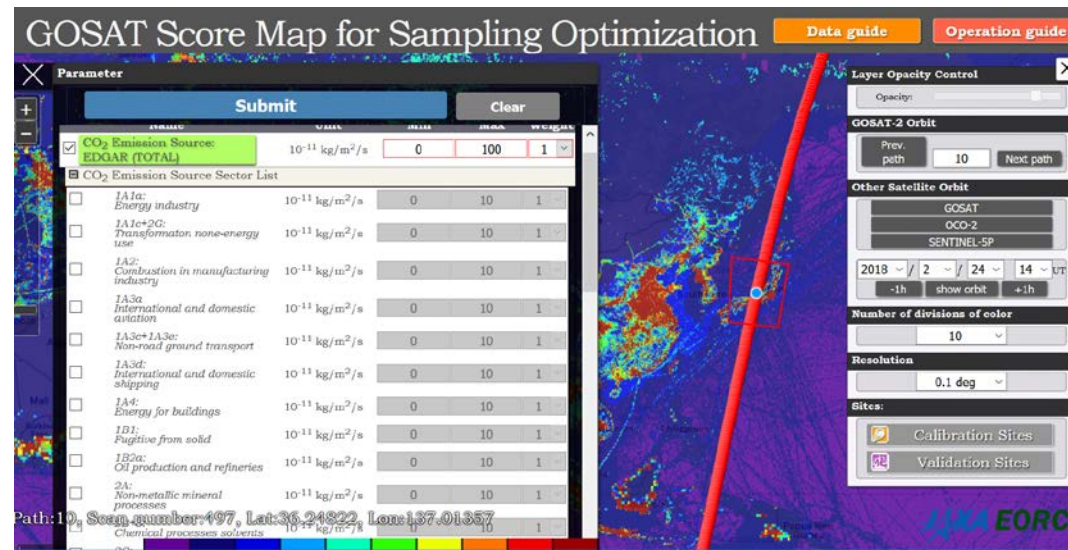
Score map for intercomparison site selection and sampling optimization for estimating global and local flux from GOSAT and GOSAT-2

**(1) GOSAT observation results and statistics** (Successful retrieval ratio ACOS L2/GOSAT L1, Surface Albedo)

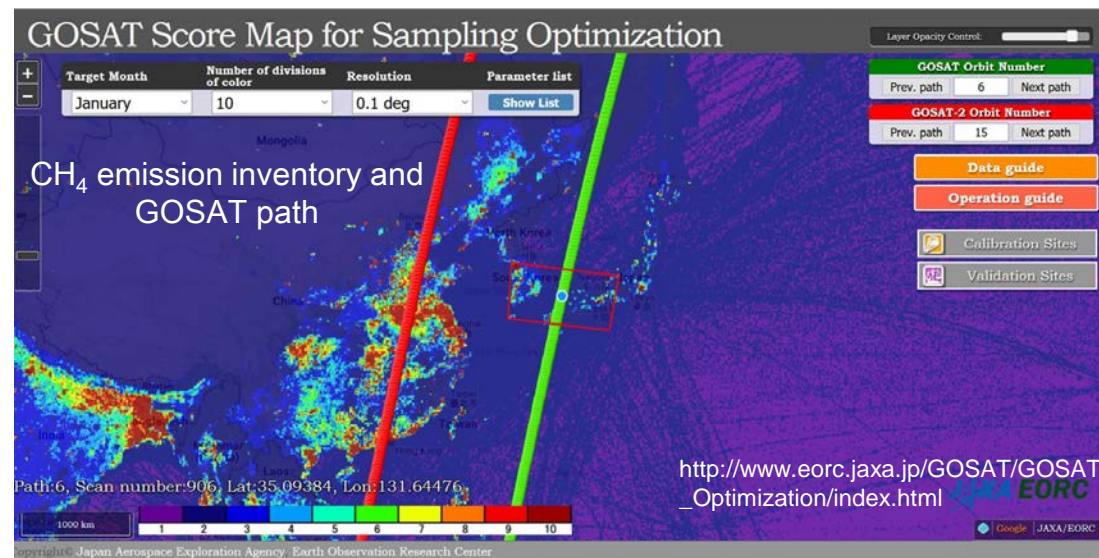
**(2) Emission and uptake Sources:** EDGAR GHG inventory from different source sectors, GOME-2 SIF, ODIAC, Population density, MOPIT CO

**(3) Observation condition:** wind speed, topography

**(4) GOSAT, GOSAT-2, OCO-2, Sentinel 5P, and targetable area from GOSAT and GOSAT-2**



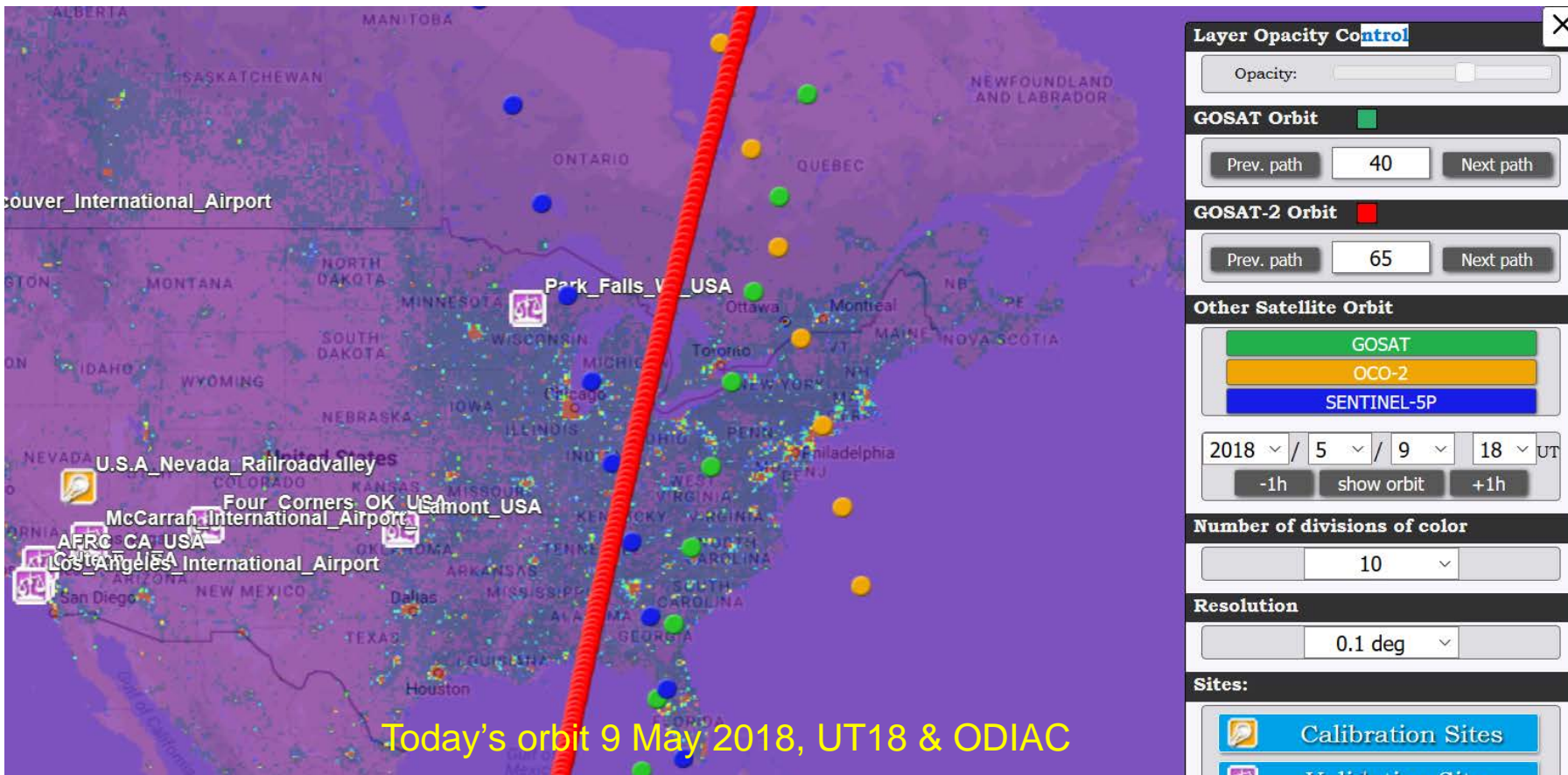
EDGAR CO<sub>2</sub> Inventory: total and individual source sectors







# GHG Satellites Constellation



Today's orbit 9 May, 2018, UT18 & ODIAC

together with GOSAT, GOSAT-2, OCO-2 orbits (=TanSat), Sentinel 5P

**Plan for 2018**  
Matched-up data set  
Common database for GHG observation instruments from space:  
Match up database of radiance spectra that include data quality, uncertainty, time, location of each instrument (GOSAT-OCO-2, GOSAT-AIRS, ..... ) will be provided.

**Kataoka's Poster**

Match-up point check tool  
[http://www.eorc.jaxa.jp/GOSAT/GOSAT\\_Optimization/index.html](http://www.eorc.jaxa.jp/GOSAT/GOSAT_Optimization/index.html)