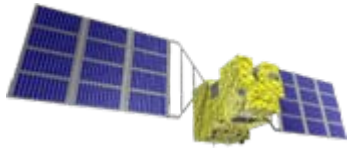


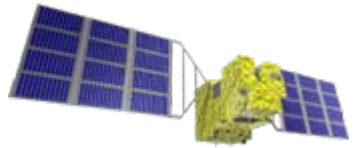
Alternative Leak Detection Technologies: GOSAT

Tatsuya Yokota
National Institute for Environmental Studies - Japan

Gen INOUE,
Professor, Research Institute of Humanity and Nature,
(via Nagoya University, National Institute for Environment Studies)
GOSAT Chief Scientist

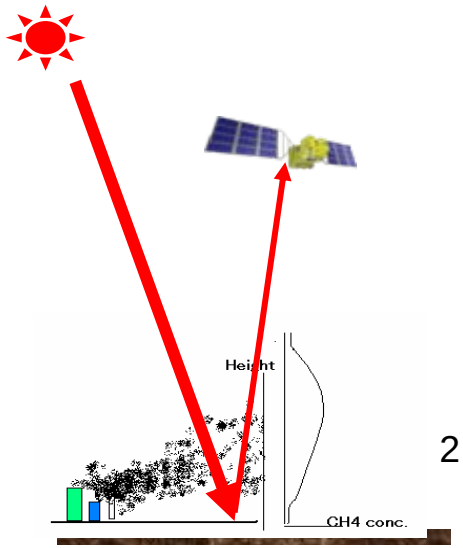
K. O'Hashi
Nippon Steel Engineering Co.,Ltd

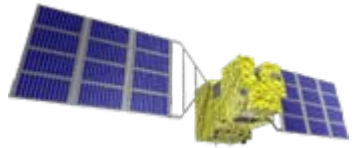
Different target/ Different method



10cm — 100m — 100km

Components	Local	Regional
●Air-sampling /Analysis ●IR absorption /Video etc	●Remote Sensing from Aircraft ●Sampling analysis on Balloon etc	●Remote Sensing from Satellite





Greenhouse gases Observing SATellite

Principle of Operation

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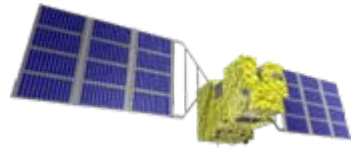
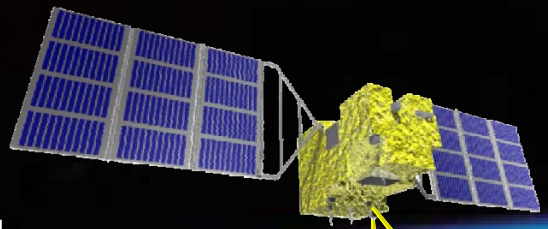
Principle of Operation





To be launched in 21st January, 2009 by Japanese H-Ⅱa rocket

GOSAT

666 km

Solar Radiation

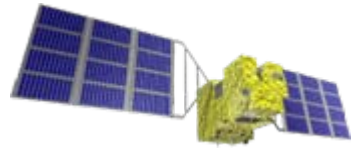
Field of view = 10 km

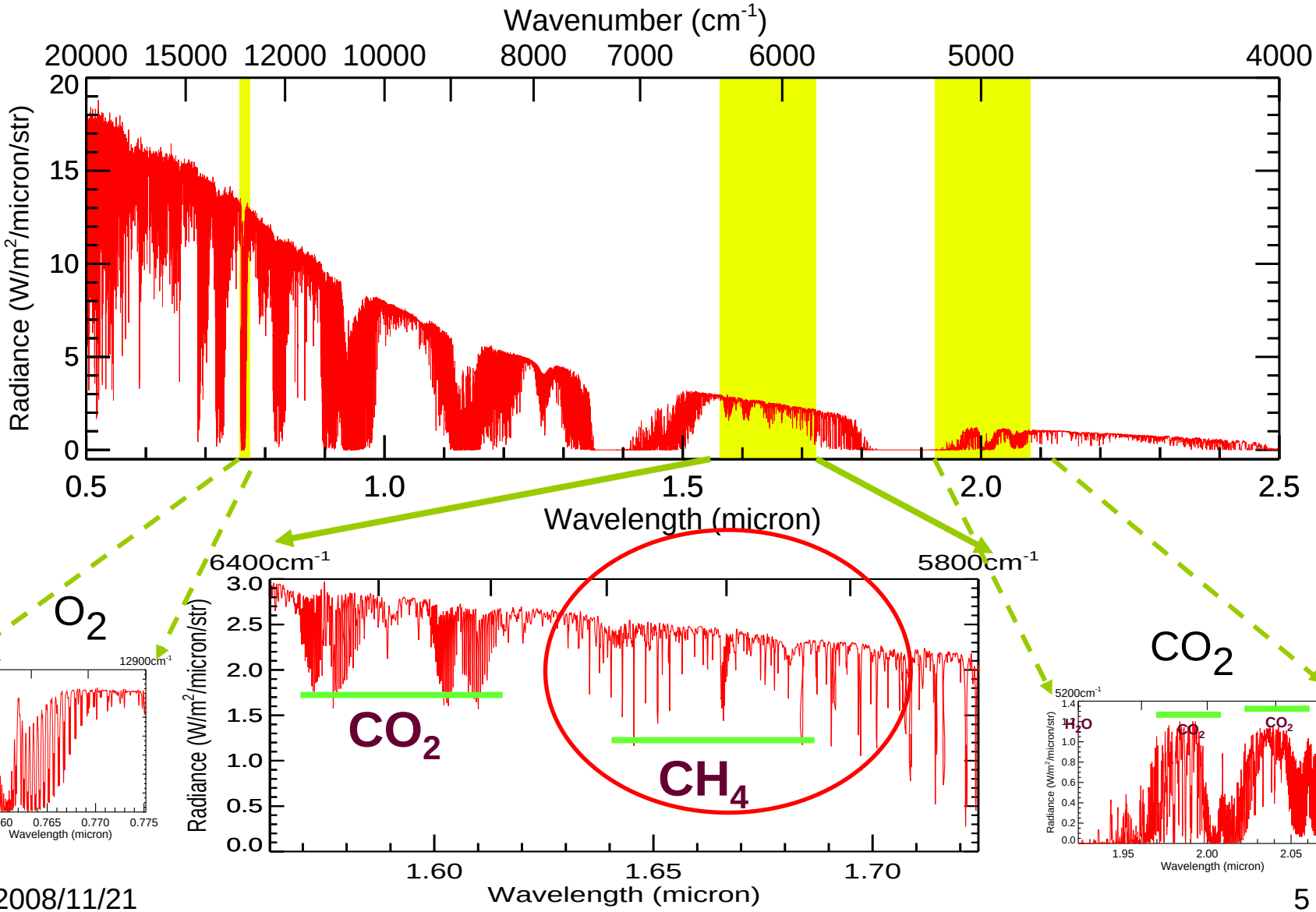
Land Surface Reflection

Sun-glint over ocean

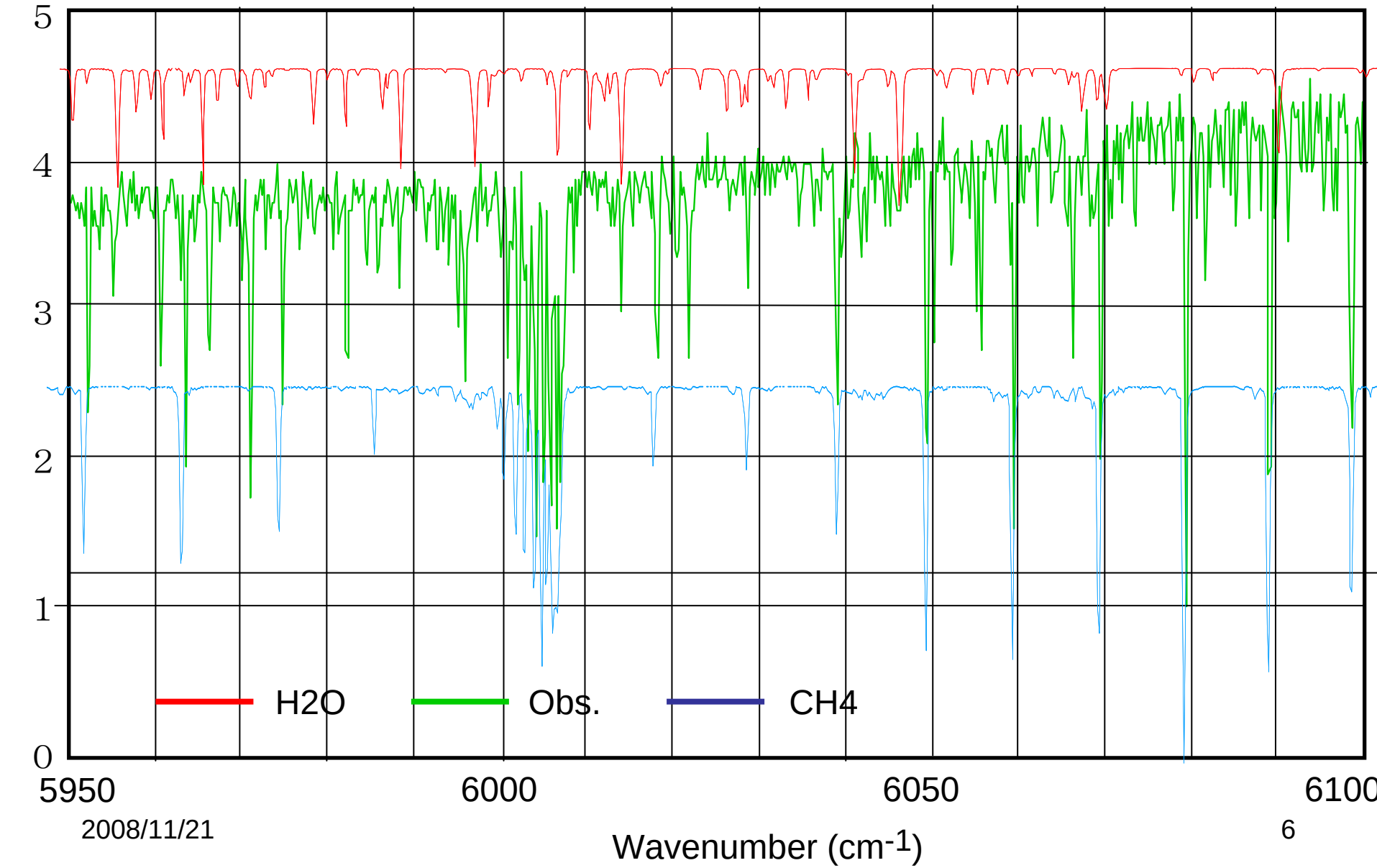
H-Ⅱa

Spectra of GOSAT sensor

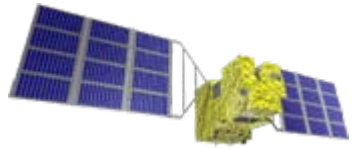




Spectra from the altitude of 12 km

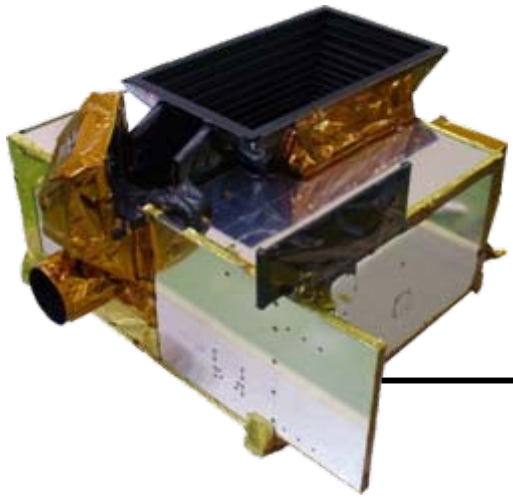


Test of GOSAT at JAXA



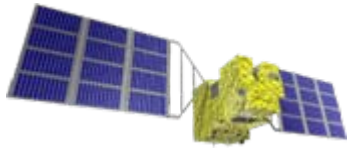
TANSO=Thermal And Near infrared Sensor for carbon Observation

TANSO-FTS
(Fourier Transform Spectrometer)

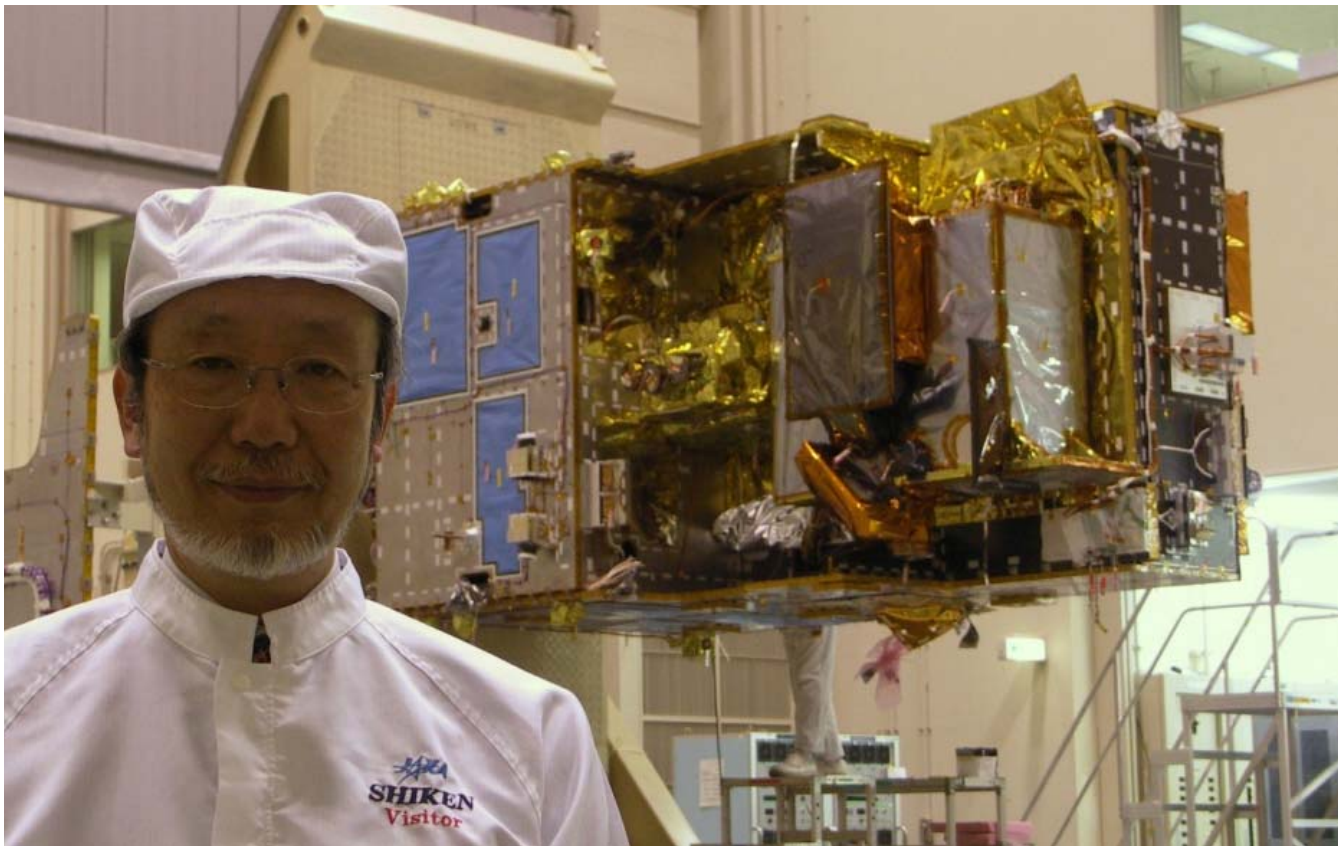


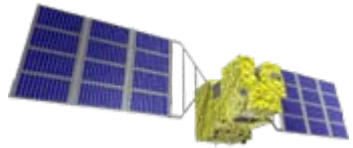
TANSO-CAI
(Cloud and Aerosol Imager)

Photo of GOSAT



GOSAT has been shipped from Tsukuba Center (JAXA) for Tanegashima (Launch Site) on 10th November.





Greenhouse gases Observing SATellite

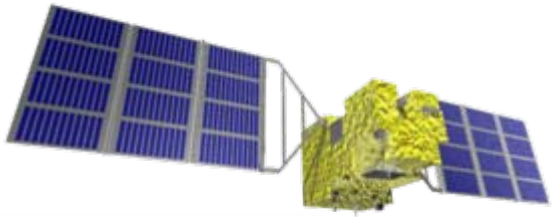
Principle of Operation

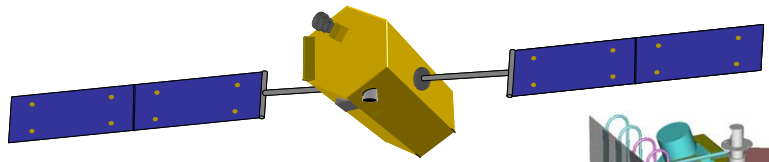
Application to Leak Detection

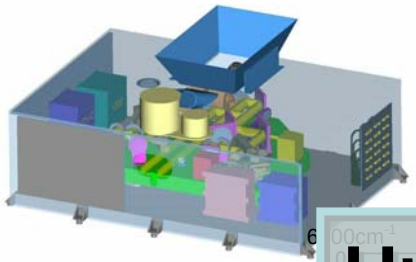
Data dispatch schedule

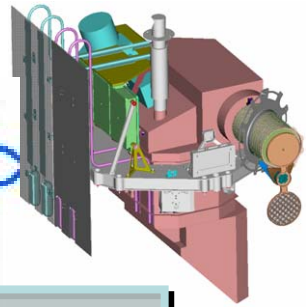
Data Policy

GOSAT and OCO



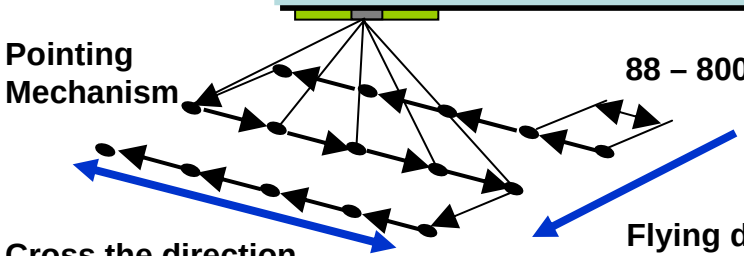


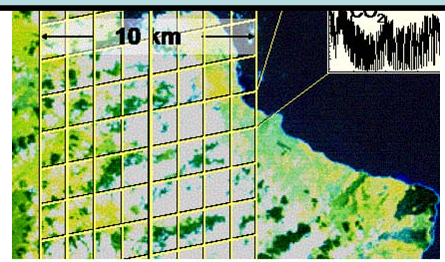


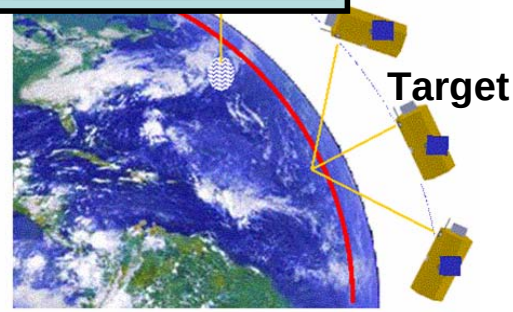


Unfortunately, OCO does not cover the spectral range of CH4. So it cannot detect the methane leakage although it scans a belt suitable for our purpose.

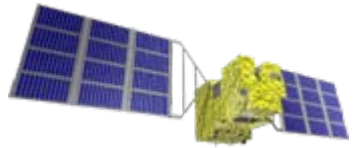
GPS



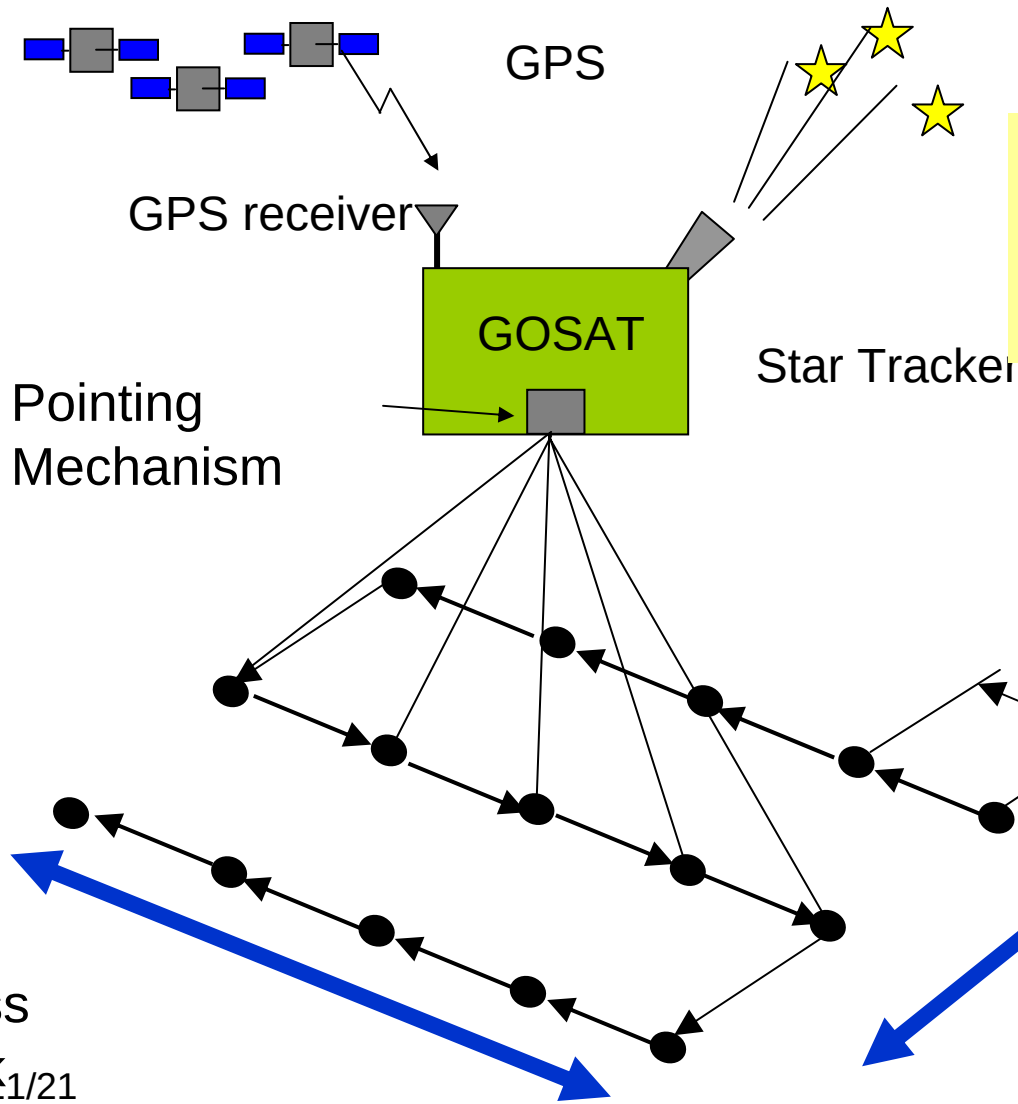




Foot prints

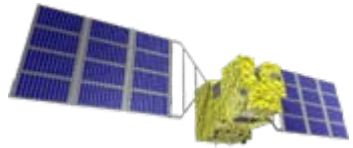


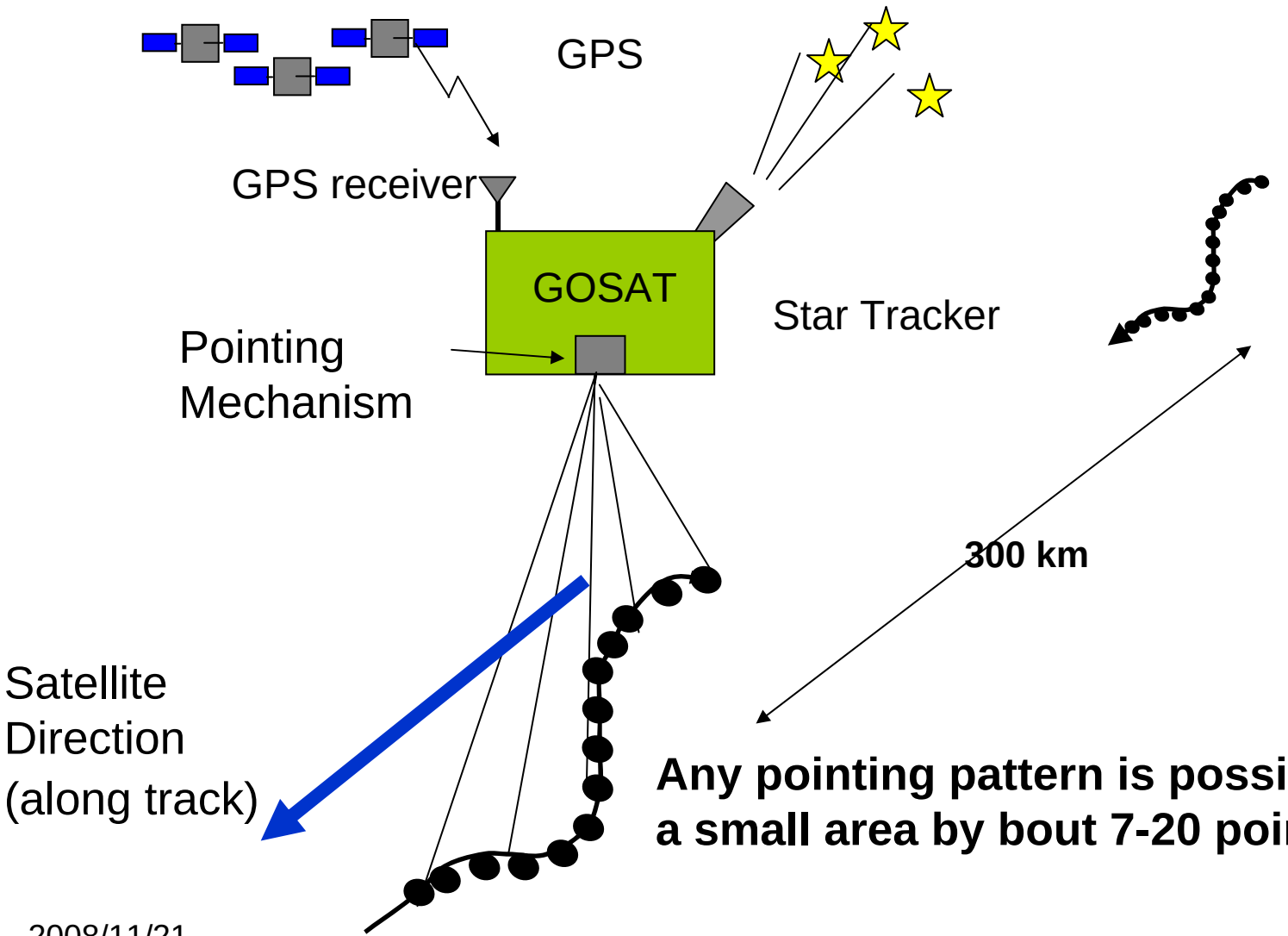
Orbit Track of OCO



cross track patters
(normally 5 points)
4 seconds/spectrum

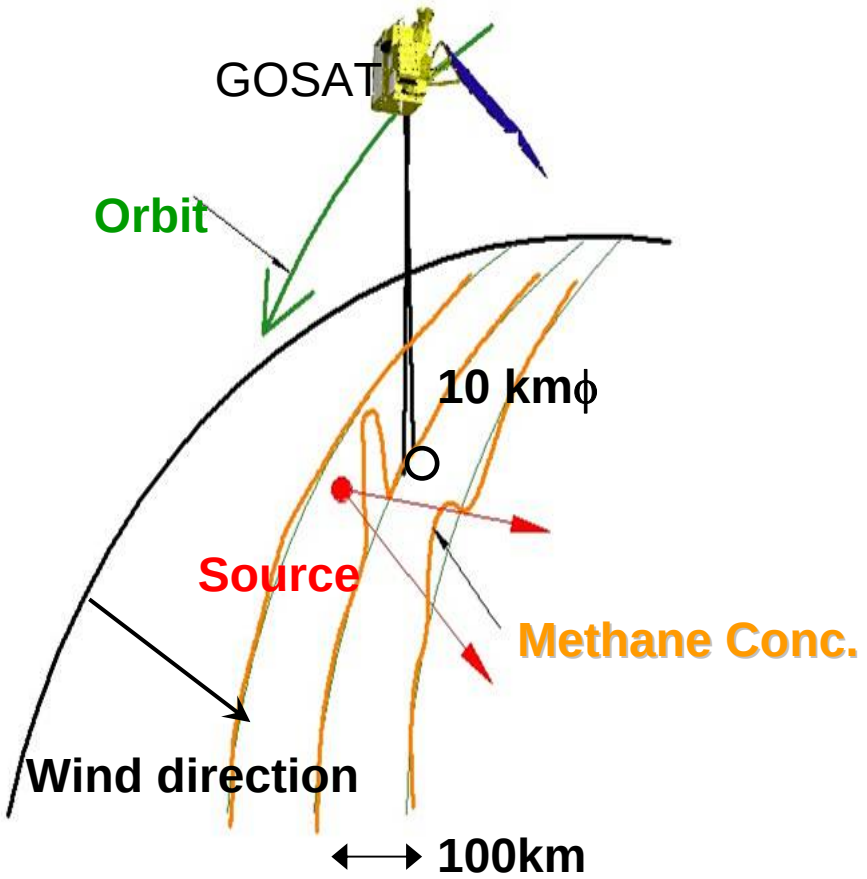
Target Mode

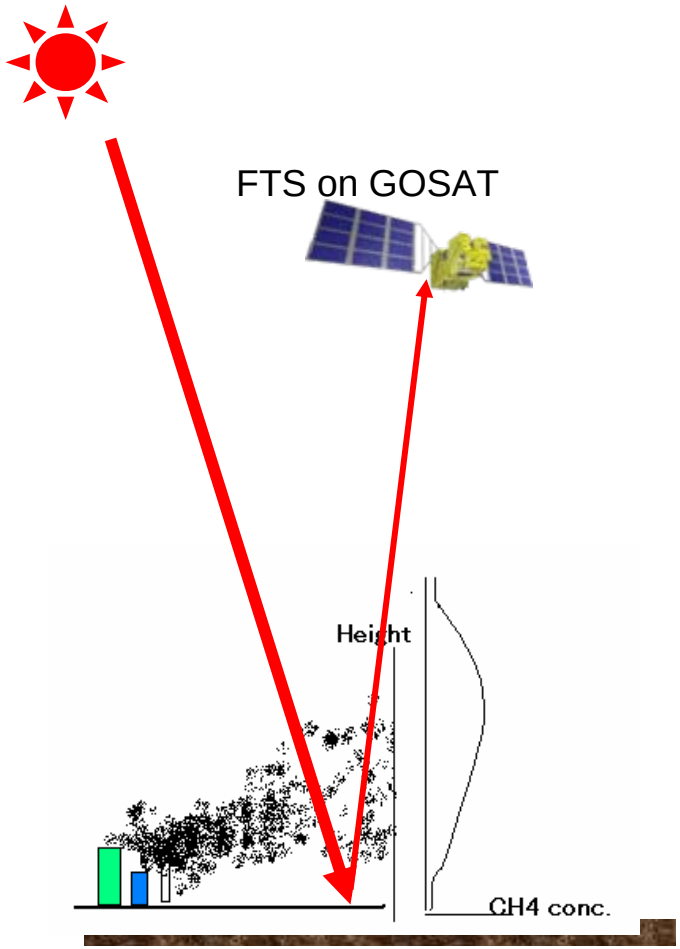




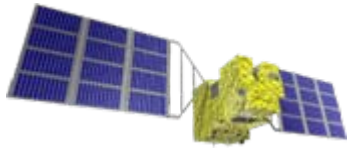
Any pointing pattern is possible within a small area by bout 7-20 points

Image of Point Source observation

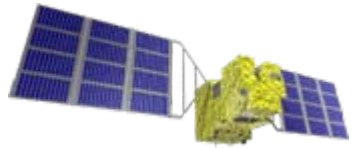




Sensitivity



- The observation of CH_4 in the precision of 0.25% means that the 4ppb difference in column can be detectable, which corresponds to about 10 tCH_4/day.
- The minimum detectable leak rate is reduced in the calm condition, when the diffusion is slow.
- There is the records of stationary leakage of 45, 79, or 0.73 tCH_4/day at compressor stations in former Soviet Union, and most of them are detectable.
- The large scale leakage which is lead to explosion is easy to detect, but the lower frequency (every three days) and the sparse coverage of observation limits the chance of detection.



Greenhouse gases Observing SATellite

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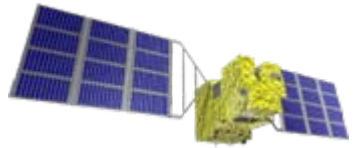
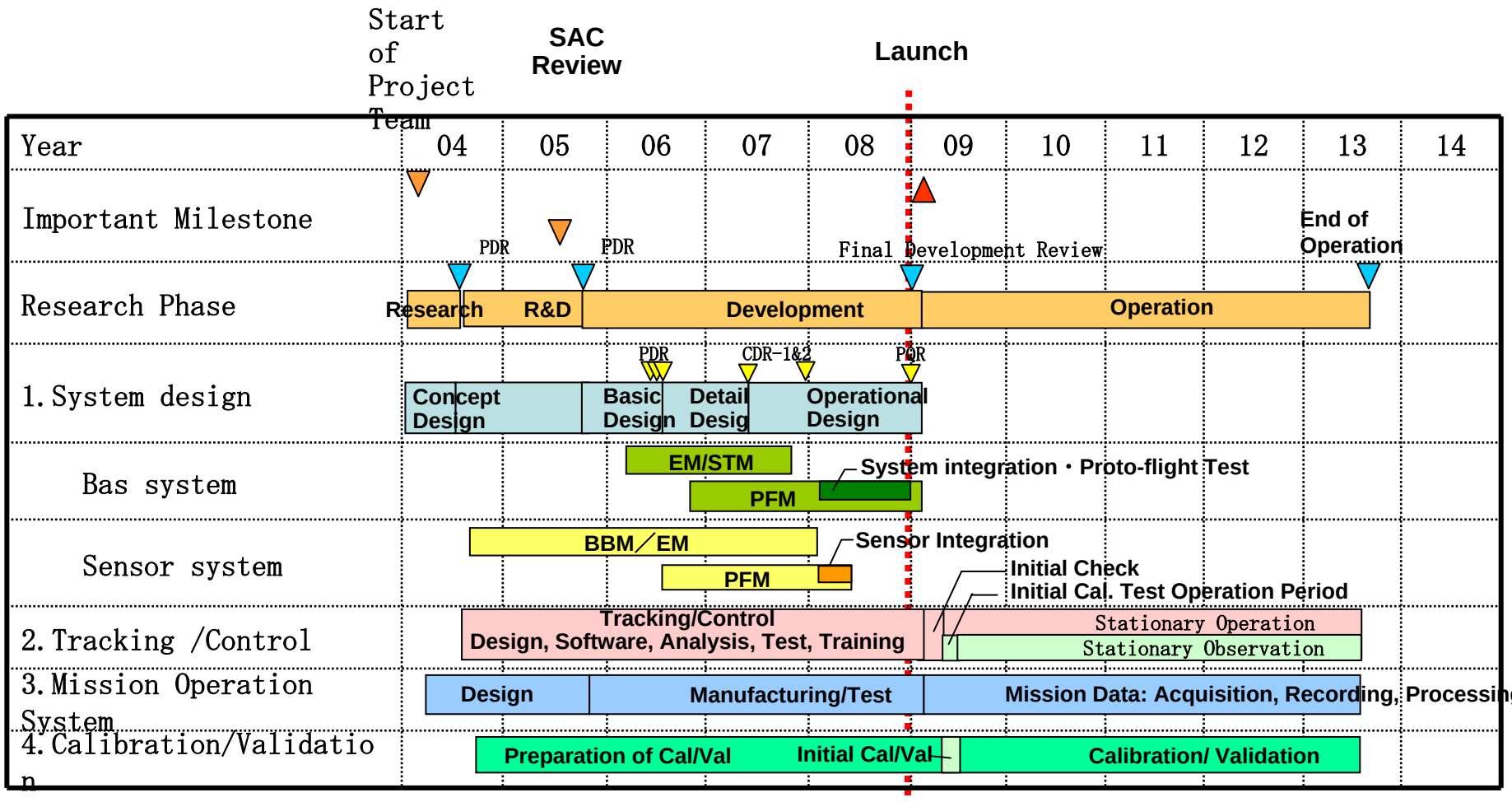
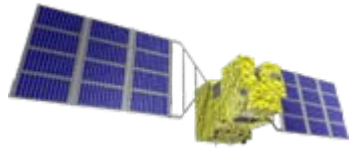
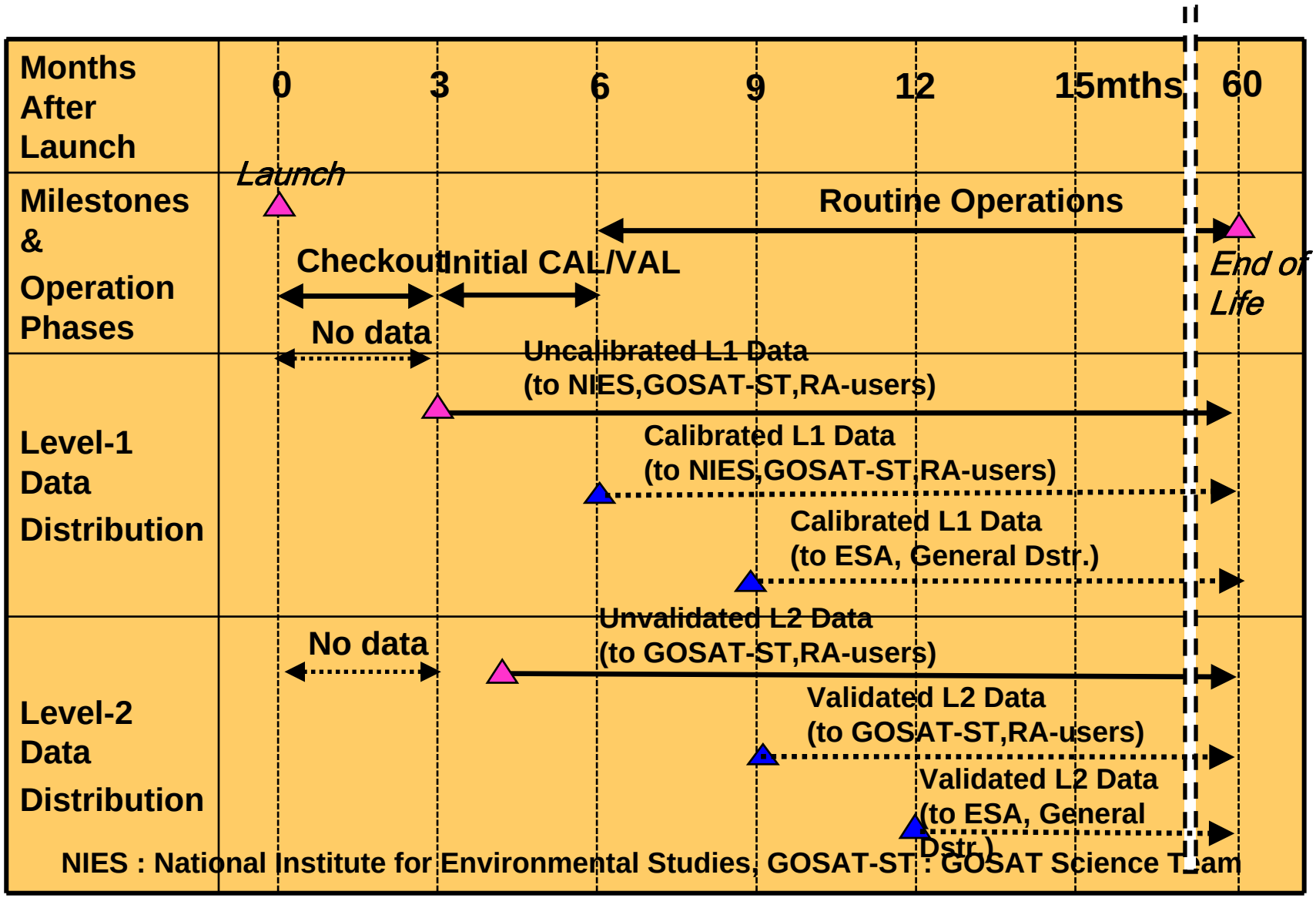
Long term schedule



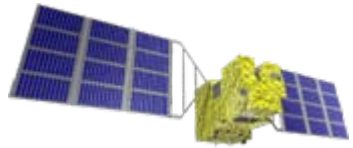


Data Distribution Schedule

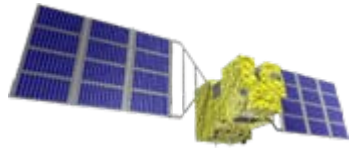




Procedure of Target Mode Observation



1. It is operated in nominal mode.
2. The spectral data is obtained in 3-5 hrs.
3. Simplified concentration estimation method in 2 hrs.
4. If abnormally high concentration is observed, the special operation targeting at this area is requested 2.5 days before.
5. Target mode data is obtained on the next track (every three days with 15 degrees intervals)
6. The flux is estimated from the concentration above the baseline and the wind velocity.



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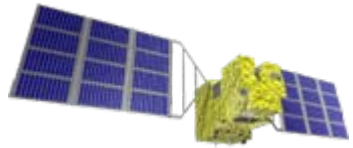
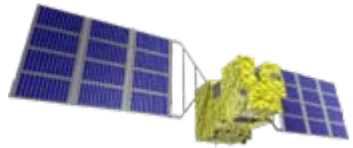


1. Data is fully open and free of charge.
2. In order to access to the data in early stage, it is recommended to apply to the Research Announcement.
3. Special Targeting Operation can be requested by the RA users only.
4. Profitable application is not allowed. It is allowed as long as it is the R/D stage.

What is the next step?



GOSAT is an experimental satellite. Mission period is 5 years.

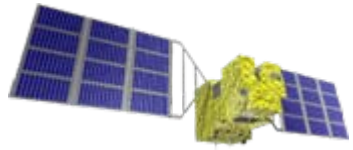
What is the next satellite (GOSAT-II)?

Low altitude orbiting satellite	The same as GOSAT	Geostatic satellite
100km	660km	30,000km
Near IR cw-Lidar	Near IR Spectrometer	Near IR Spectrometer with a Telescope

Precise location, Smaller leakage
GHG emission inventory (large scale plants, forest fire events, big cities, etc.)

Accident, Large leakage
Disaster: Tsunami
Air pollution: Time series

GOSAT
Greenhouse gases Observing SATellite



Thank you