

COP22 Japan Side Event  
"Efforts toward satellite data utilization  
for IPCC Guideline of GHG Inventories"

*Japan Pavilion, Marrakesh, Morocco,  
13:00-14:30, 14 November 2016*

# GOSAT and GOSAT-2 missions for successive GHG monitoring



Kei Shiomi

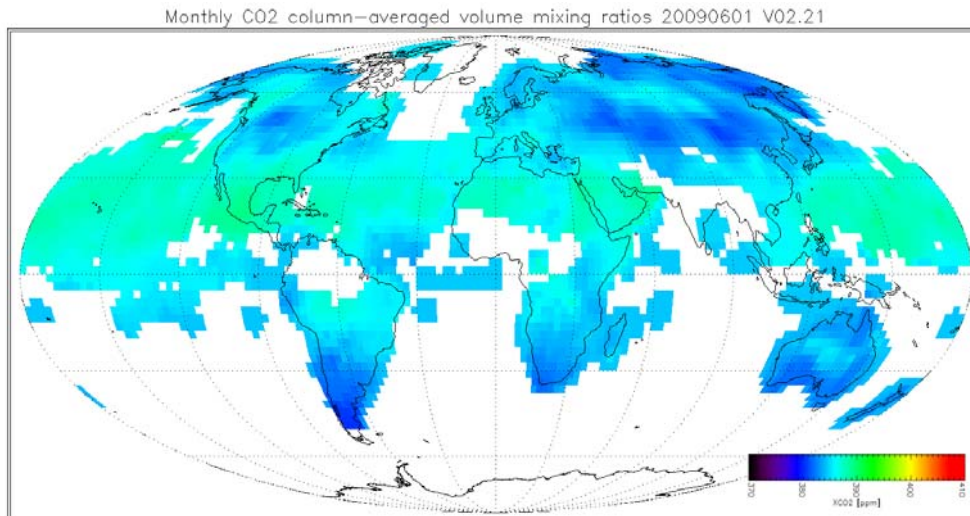
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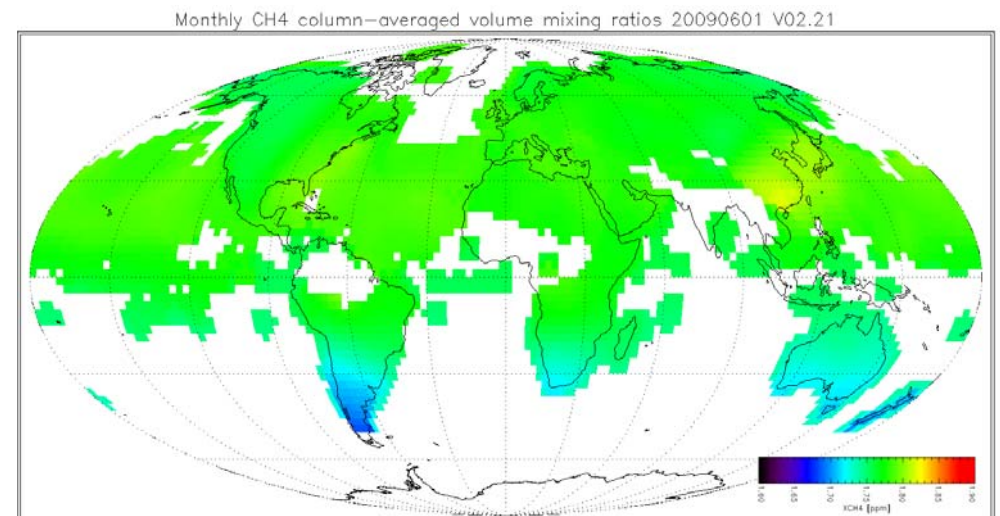


# GOSAT CO<sub>2</sub> and CH<sub>4</sub> over 7.5 years

Monthly mean global CO<sub>2</sub> and CH<sub>4</sub> since 2009



Global XCO<sub>2</sub> L3 map



Global XCH<sub>4</sub> L3 map

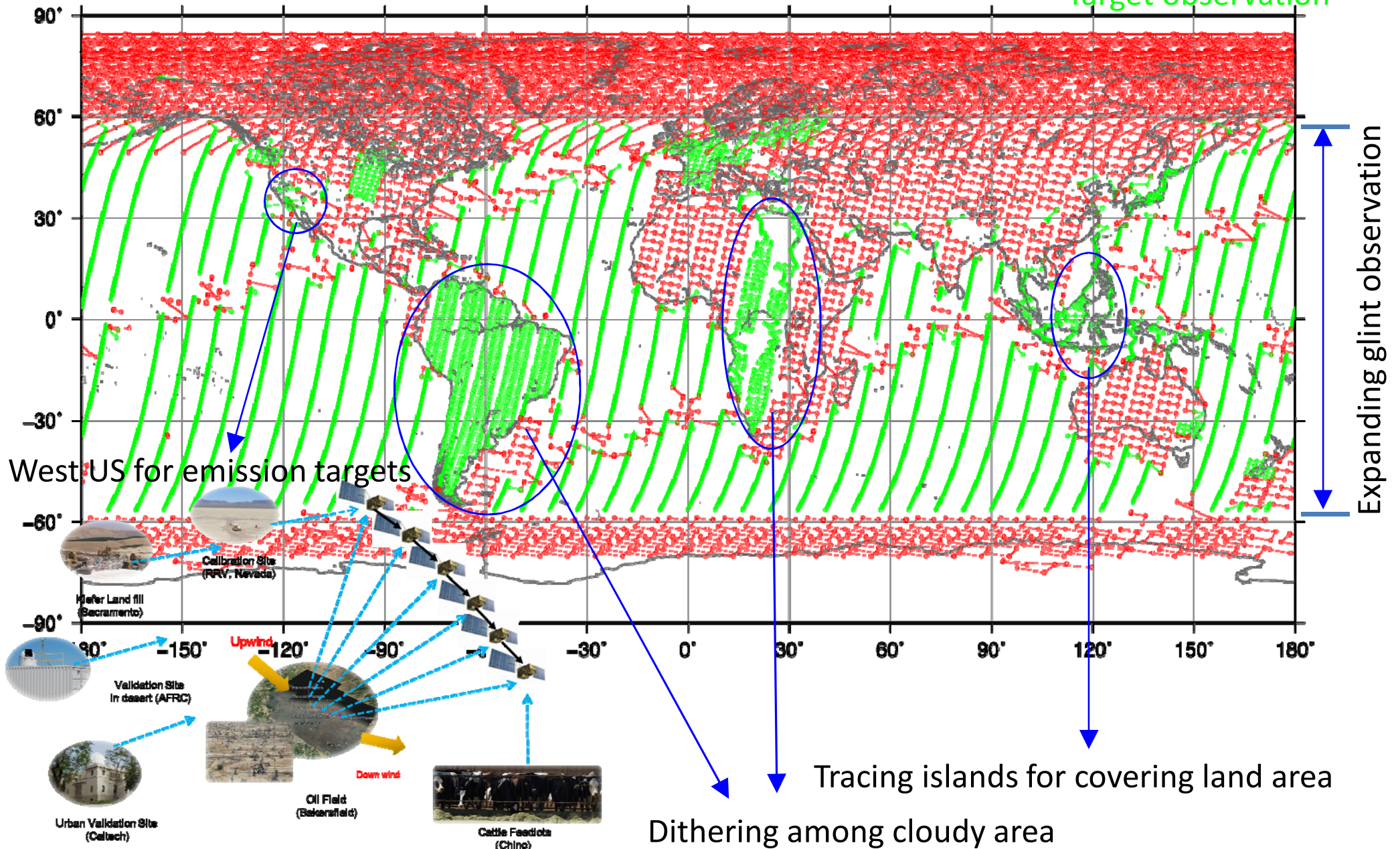
The typical accuracy of retrieved column-averaged dry air mole fractions of CO<sub>2</sub> and CH<sub>4</sub> are 2ppm or 0.5% and 13ppb or 0.7%, respectively.



# Optimization of observation points

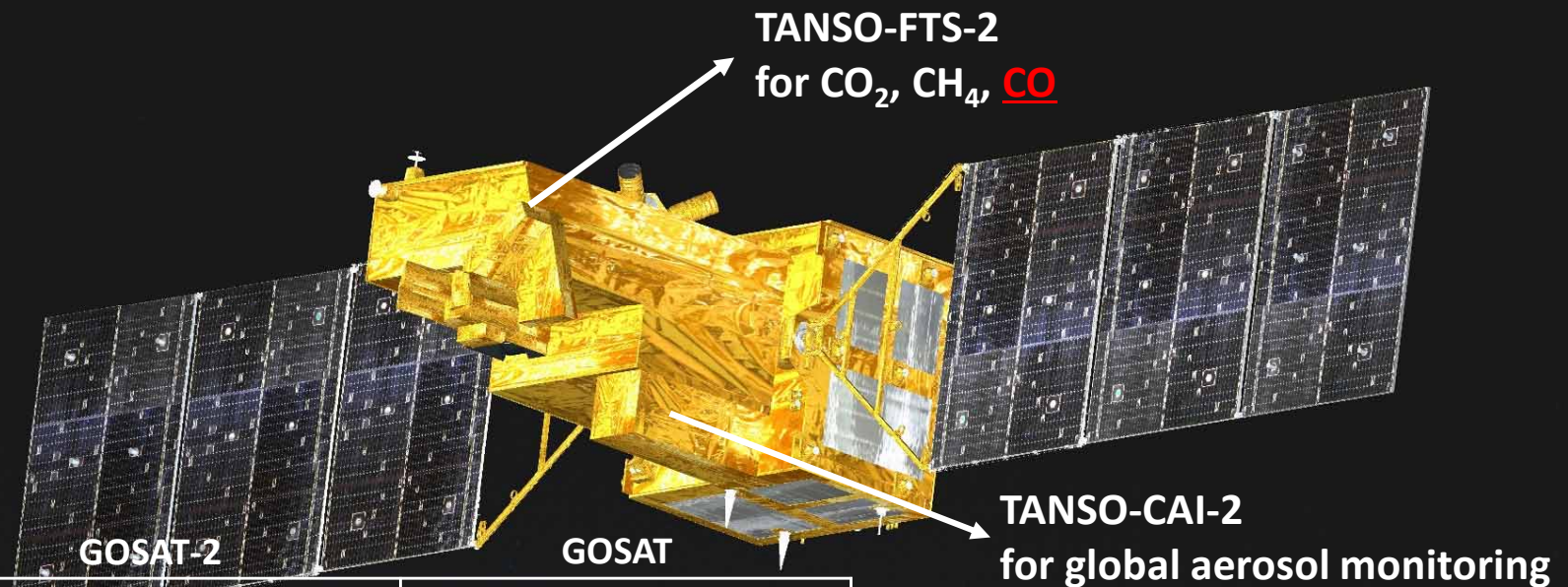
GOSAT FTS observation in June 22-24, 2016

Grid observation  
Target observation





# GOSAT-2 specifications



|                |  |  |
|----------------|--|--|
| Main body Size | 5.3 m x 2.0 m x 2.1 m<br>(Wing Span 16.5m) | 3.7 m x 1.8 m x 2.0 m<br>(Wing Span 13.7m) |
| Total Mass     | 1700kg                                     | 1750kg                                     |
| Total Power    | <u>5.0 kW(EOL)</u>                         | 3.8 kW (EOL)                               |
| Life Time      | 5 years                                    | 5 years                                    |
| Orbit          | sun synchronous orbit                      | sun synchronous orbit                      |
|                | Local time                                 | 13:00+/-0:15                               |
|                | Altitude                                   | <u>613km</u>                               |
|                | Inclination                                | <u>98deg</u>                               |
|                | Repeat                                     | <u>6 days (89 revol.)</u>                  |
| Launch         | Vehicle                                    | H-IIA                                      |
|                | Schedule                                   | JFY2017                                    |
|                |  | 23 Jan., 2009                              |

## Upgrade points

### FTS-2:

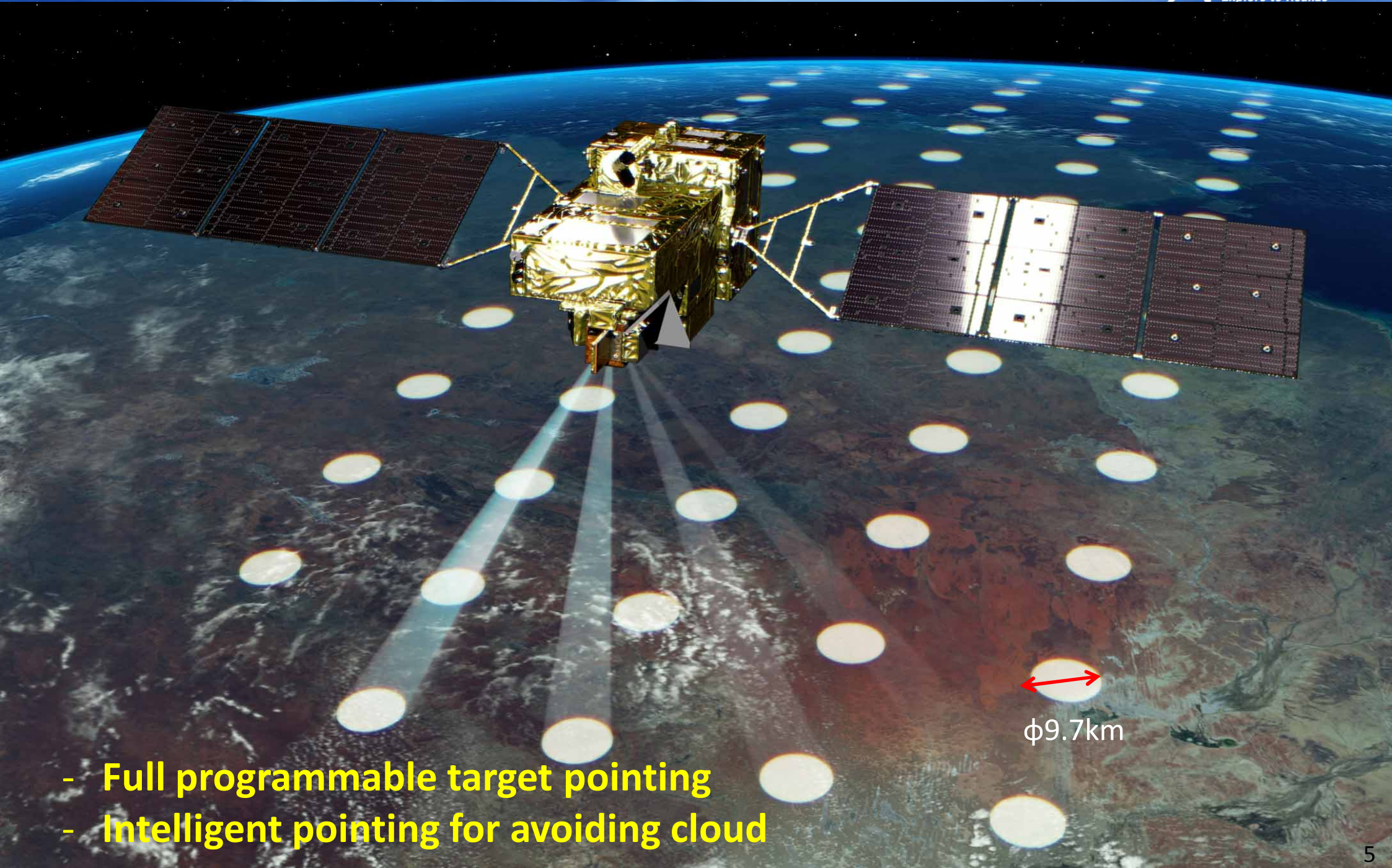
- CO detectability
- Intelligent pointing
- Full programmable pointing

### CAI-2:

- Forward/Backward looking
- 340nm detectability
- Bi-directional detectability



# GOSAT-2 observation scheme

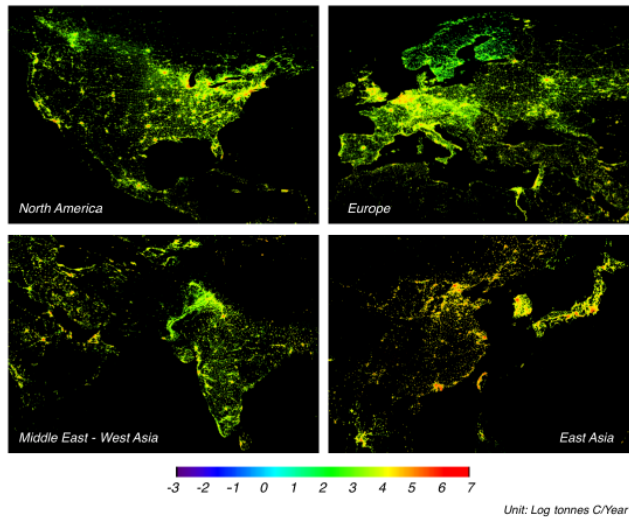


- Full programmable target pointing
- Intelligent pointing for avoiding cloud



# Strategic observation by full programmable target pointing

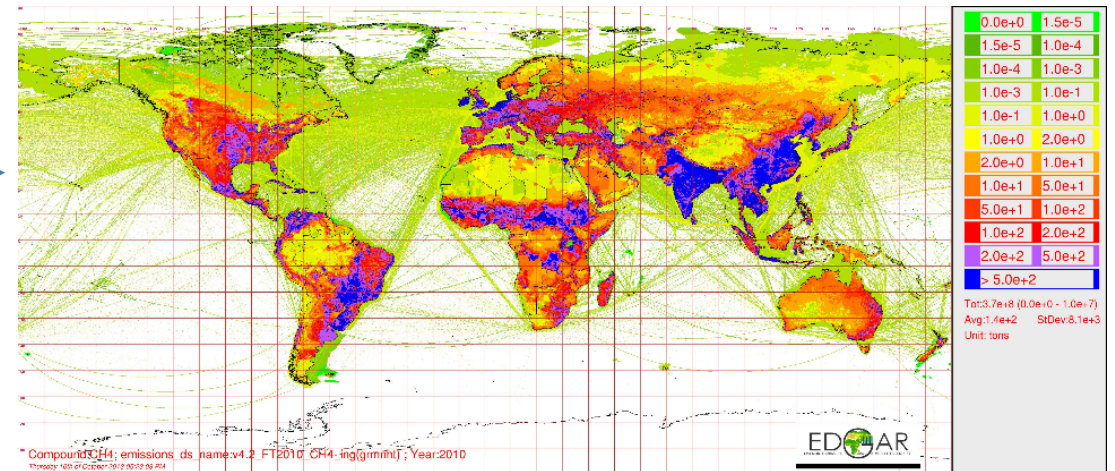
## CO<sub>2</sub> emission database



ODIAC, Oda and Maksyutov, ACP, 2011

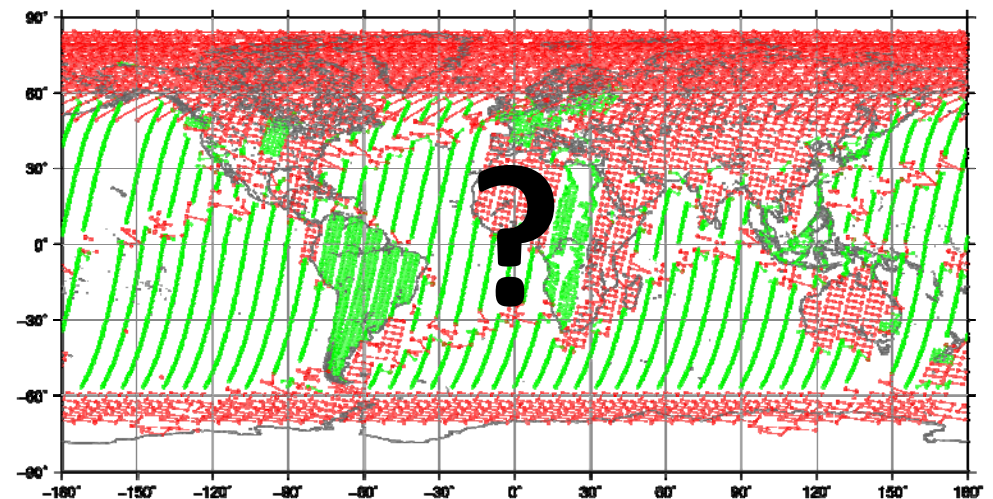
- Clear sky area by using cloud cover climatology
- Reducing observation uncertainty (less surface roughness, low aerosol, view direction etc.)
- Observation numbers and locations for flux inversions

## CH<sub>4</sub> emission database

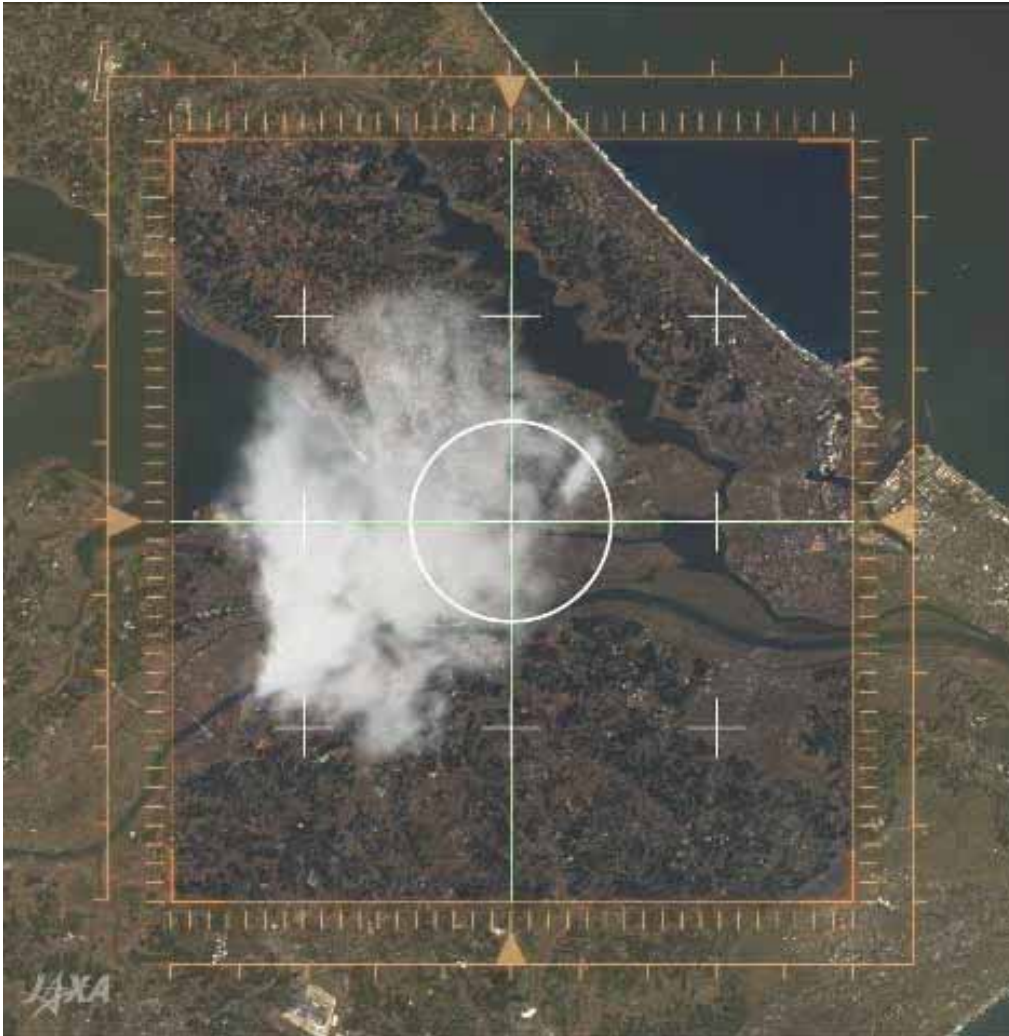


EDGAR v4.2, EC, JRC/PBL

## More optimized sampling locations



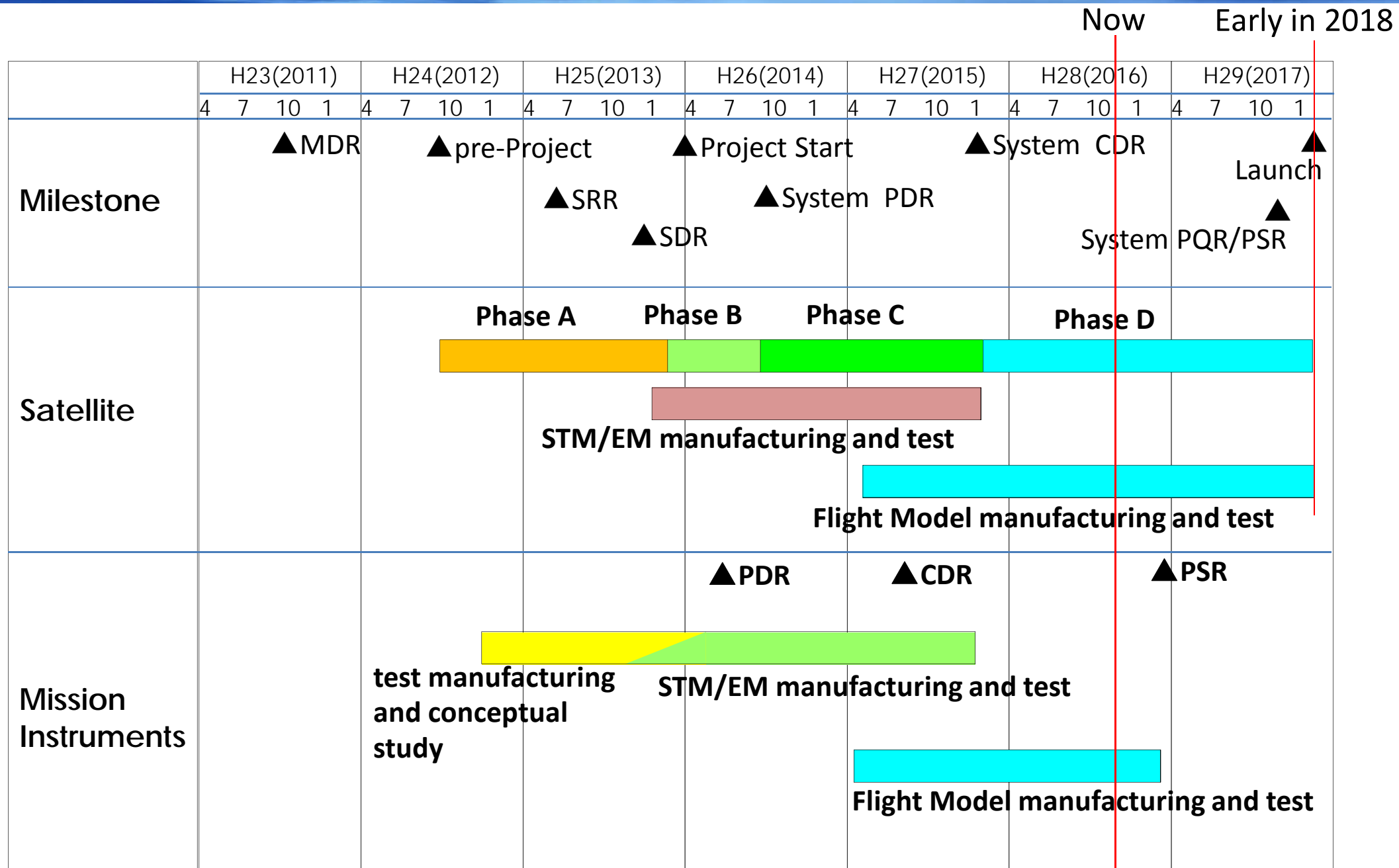
# Intelligent pointing for clear-sky data



The GOSAT-2 FTS views pre-determined programming locations. However, cloud scene is an interference of GHG observation in the surface layer.

The intelligent pointing system is an automatically detection of the cloud area on orbit by using visible monitor camera and changing the pointing direction before the data acquisition.

# GOSAT-2 development schedule







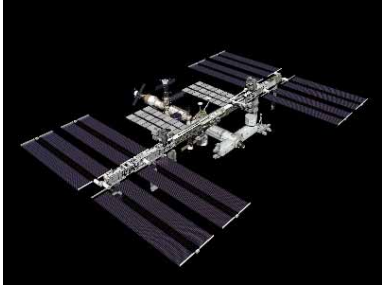
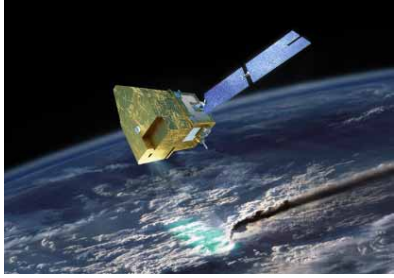
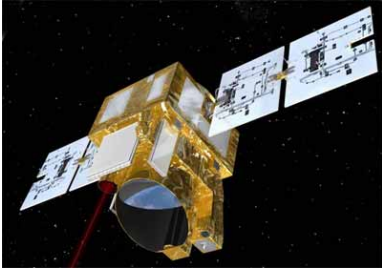


Now

Early in 2018



# Space-borne GHG monitoring with partners

|  |  |   |   |  |
|--|--|---|---|--|
| <p>SCIAMACHY (ESA)<br/>2003-2012<br/>CO<sub>2</sub>, CH<sub>4</sub></p>  | <p>GOSAT (Japan)<br/>2009-present<br/>CO<sub>2</sub>, CH<sub>4</sub></p>  | <p>OCO-2 (NASA)<br/>2014-present<br/>CO<sub>2</sub></p>                 | <p>TanSat (China)<br/>2016-<br/>CO<sub>2</sub></p>           | <p>TROPOMI / S-5P<br/>2017-<br/>CH<sub>4</sub></p>                                    |
| <p>GOSAT-2 (Japan)<br/>2018-<br/>CO<sub>2</sub>, CH<sub>4</sub></p>    | <p>OCO-3 (NASA)<br/>2018-<br/>CO<sub>2</sub></p>                        | <p>MicroCarb (CNES)<br/>2020-<br/>CO<sub>2</sub>, CH<sub>4</sub></p>  | <p>MERLIN<br/>(CNES/DLR)<br/>2021-<br/>CH<sub>4</sub></p>  | <p>Future proposals</p> <ul style="list-style-type: none"> <li>UVNS / S-5<br/>(Europe)</li> <li>Lidar mission<br/>(NASA)</li> <li>Carbon mission<br/>(Europe)</li> </ul> |

Continuous GHG measurement from space will contribute to reveal global and regional carbon flux change.