

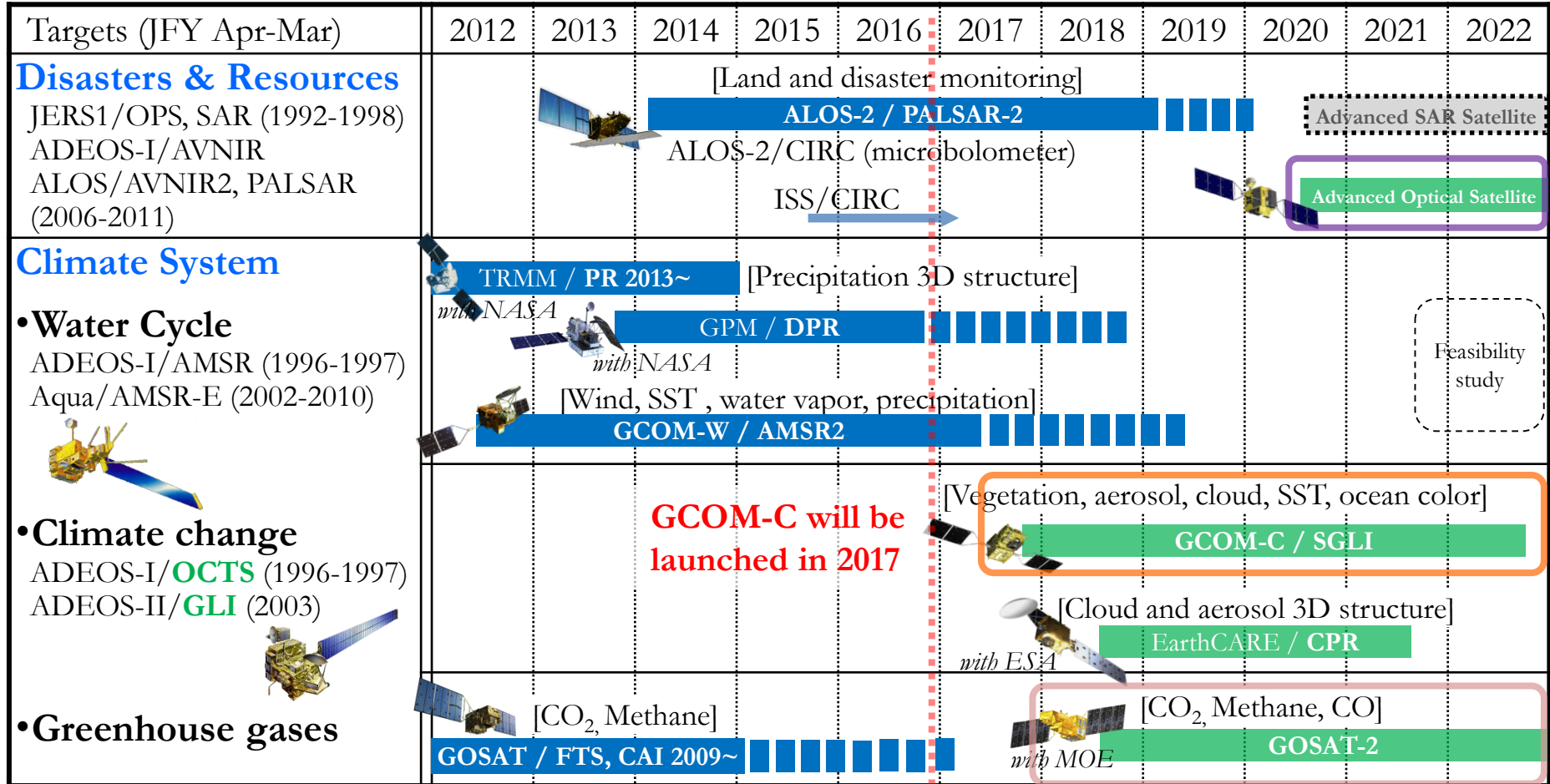
# JAXA Optical Sensors

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JAXA/EORC

CEOS IVOS Mar. 2017

# 1. JAXA Earth observation satellite missions



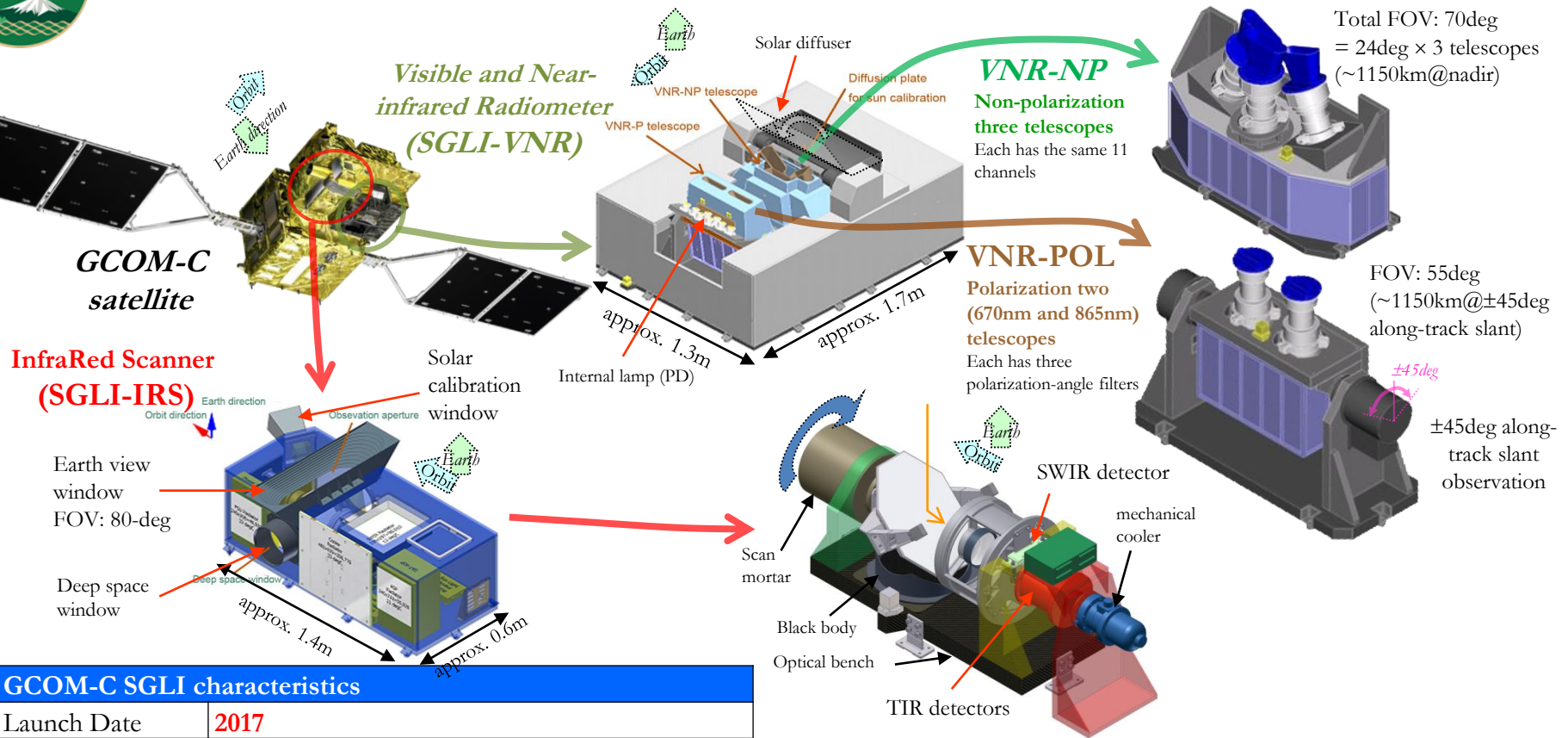
(ref.) JMA  
meteorological  
satellites



Mission status    On orbit    Development    Study    Pre-phase-A



# 1. GCOM-C/SGLI



## GCOM-C SGLI characteristics

|                    |                                                                                       |
|--------------------|---------------------------------------------------------------------------------------|
| Launch Date        | 2017                                                                                  |
| Weight             | 2,000kg                                                                               |
| Orbit              | Sun-synchronous (descending local time: 10:30), Altitude: 798km, Inclination: 98.6deg |
| Mission Life       | 5 years (3 satellites; total 13 years)                                                |
| Scan               | Push-broom electric scan (VNR: VN & P)<br>Wisk-broom mechanical scan (IRS: SW & T)    |
| Scan width         | 1150km cross track (VNR: NP & POL)<br>1400km cross track (IRS: SWIR & TIR)            |
| Spatial resolution | 250m, 500m, 1km                                                                       |
| Polarization       | 3 polarization angles for POL                                                         |
| Along track tilt   | Nadir for VN, SW and TIR, & +/-45 deg for POL                                         |





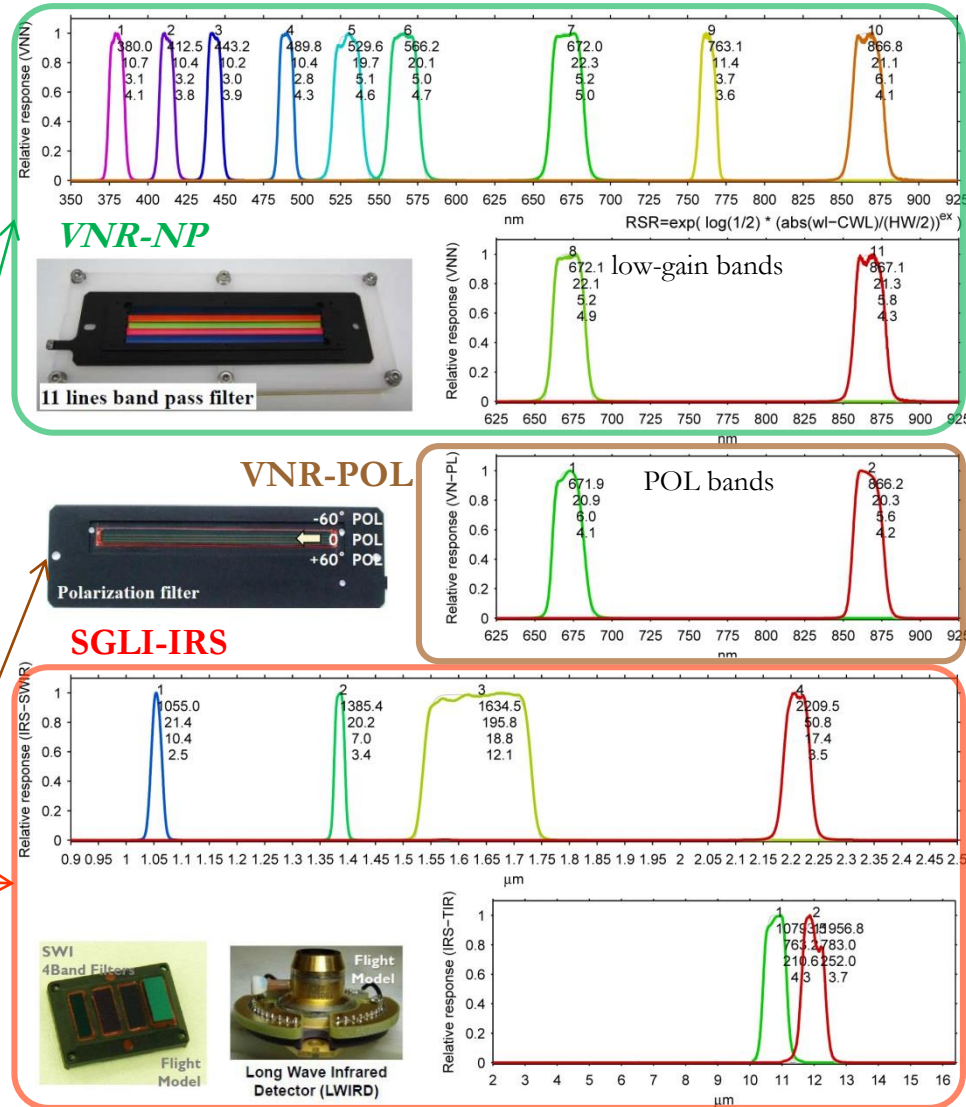
# 1. GCOM-C/SGLI

The RSR data will be open to the public soon

Specification of SGLI spectral bands

| CH   | $\lambda$<br>nm | $\Delta\lambda$ | $L_{std}$<br>W/m <sup>2</sup> /sr/μm<br>K: Kelvin | $L_{max}$<br>W/m <sup>2</sup> /sr/μm<br>K: Kelvin | SNR@ $L_{std}$<br>-<br>K: NEAT | IFOV<br>m    |
|------|-----------------|-----------------|---------------------------------------------------|---------------------------------------------------|--------------------------------|--------------|
| VN1  | 380             | 10              | 60                                                | 210                                               | 250                            | 250 /1000    |
| VN2  | 412             | 10              | 75                                                | 250                                               | 400                            | 250 /1000    |
| VN3  | 443             | 10              | 64                                                | 400                                               | 300                            | 250 /1000    |
| VN4  | 490             | 10              | 53                                                | 120                                               | 400                            | 250 /1000    |
| VN5  | 530             | 20              | 41                                                | 350                                               | 250                            | 250 /1000    |
| VN6  | 565             | 20              | 33                                                | 90                                                | 400                            | 250 /1000    |
| VN7  | 673.5           | 20              | 23                                                | 62                                                | 400                            | 250 /1000    |
| VN8  | 673.5           | 20              | 25                                                | 210                                               | 250                            | 250 /1000    |
| VN9  | 763             | 12              | 40                                                | 350                                               | 1200*                          | 250 /1000*   |
| VN10 | 868.5           | 20              | 8                                                 | 30                                                | 400                            | 250 /1000    |
| VN11 | 868.5           | 20              | 30                                                | 300                                               | 200                            | 250 /1000    |
| POL1 | 673.5           | 20              | 25                                                | 250                                               | 250                            | 1000         |
| POL2 | 868.5           | 20              | 30                                                | 300                                               | 250                            | 1000         |
| SW1  | 1050            | 20              | 57                                                | 248                                               | 500                            | 1000         |
| SW2  | 1380            | 20              | 8                                                 | 103                                               | 150                            | 1000         |
| SW3  | 1630            | 200             | 3                                                 | 50                                                | 57                             | 250 /1000    |
| SW4  | 2210            | 50              | 1.9                                               | 20                                                | 211                            | 1000         |
| TIR1 | 10800           | 700             | 300K                                              | 340K                                              | 0.2K                           | 250/500/1000 |
| TIR2 | 12000           | 700             | 300K                                              | 340K                                              | 0.2K                           | 250/500/1000 |

Multi-angle obs. for 674nm and 869nm



Uchikawa, T., K. Tanaka, Y. Okamura, S. Tsuda, and T. Amano, "Proto Flight Model (PFM) performance and development status of Cisible and Near Infrared Radiometer (VNR) on the Second-generation Global Imager (SGLI)", SPIE Asia-Pacific Remote sensing, Beijing, China, 9264-27, 2014.

Tanaka, K., Y. Okamura, T. Amano, T. Hosokawa, and T. Uchikita, "The development status of Second Generation Global Imager Infrared Scanning Radiometer (SGLI-IRS)", SPIE Asia-Pacific Remote sensing, Beijing, China, 9264-15, October, 2014.





# 1. GCOM-C/SGLI development

- SGLI final radiometric tests has been finished in 2016
- Barium-sulfate and Spectralon integrating spheres were used for VNR
  - Absolute performance is characterized by the barium sulfate integrating sphere (lifetime of the lamps of the Barium-sulfate integrating sphere were not enough for all characterization tests)
  - Relative performance is characterized by the Spectralon integrating sphere
  - The consistency of two integrating spheres is confirmed through the linearity performance evaluation
- Gold-coated integrating sphere were used for SWIR
- The performances of each band and pixel were characterized and satisfied the requirement (SNR, gain, dynamic range, stability, uniformity, linearity..)
- The radiometric parameters are implemented in the ground system
- **GCOM-C/SGLI will be launched in 2017**

See details:

Hashiguchi et al., Radiometric performance of Second Generation Global Imager (SGLI) using integrating sphere, *SPIE Remote Sensing 2016 at Edinburgh, United Kingdom Sep. 26, 2016*

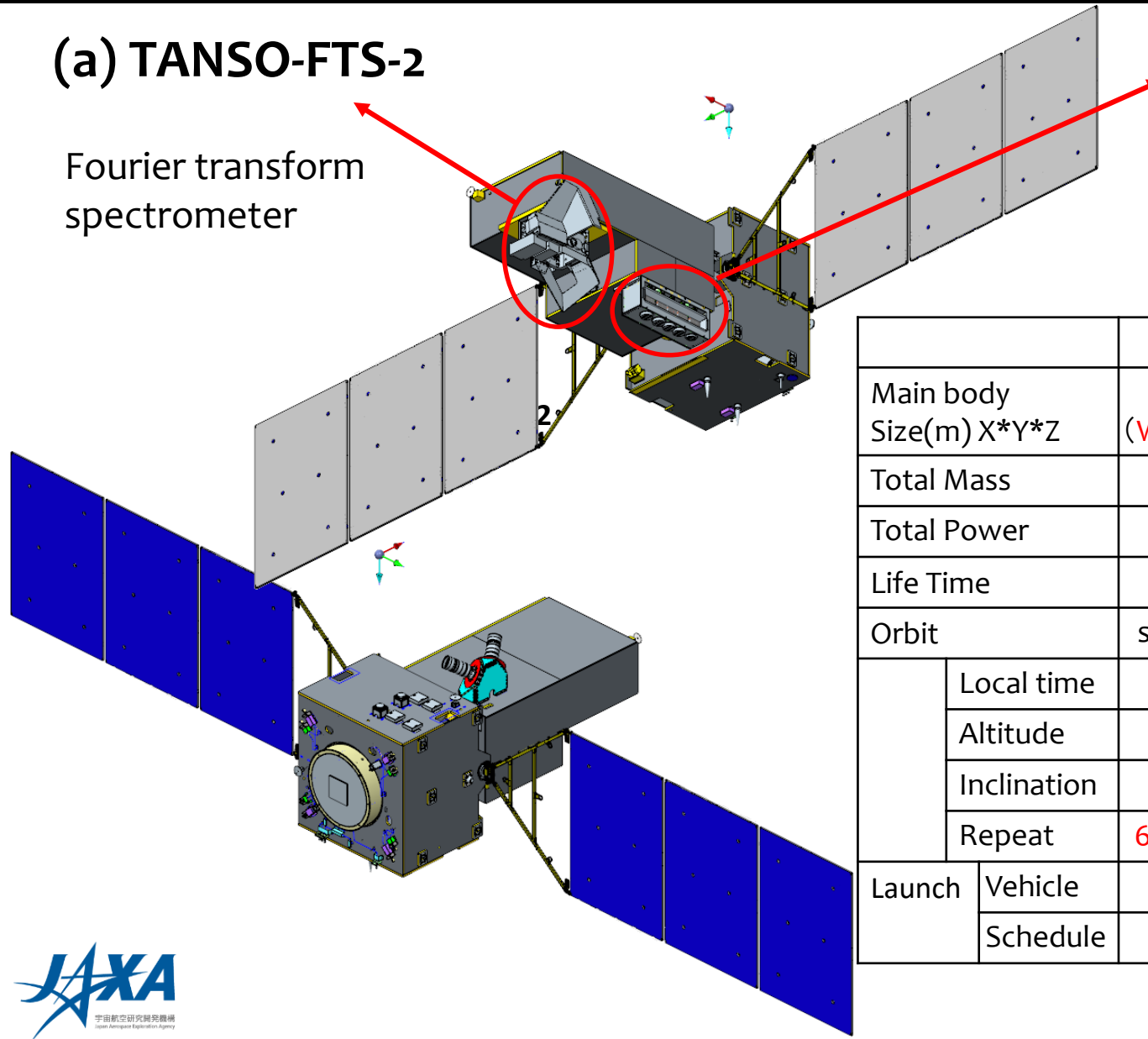
## 2. GOSAT-2

### (a) TANSO-FTS-2

Fourier transform spectrometer

### (b) TANSO-CAI-2

Push-broom imager



|                         |             | GOSAT-2                              | GOSAT                                |
|-------------------------|-------------|--------------------------------------|--------------------------------------|
| Main body Size(m) X*Y*Z |             | 5.8 x 2.0 x 2.1<br>(Wing Span 16.5m) | 3.7 x 1.8 x 2.0<br>(Wing Span 13.7m) |
| Total Mass              |             | 1800kg                               | 1750kg                               |
| Total Power             |             | 5.0 kW(EOL)                          | 3.8 kW (EOL)                         |
| Life Time               |             | 5 years                              | 5 years                              |
| Orbit                   |             | sun synchronous                      | sun synchronous                      |
|                         | Local time  | 13:00+/-0:15                         | 13:00+/-0:15                         |
|                         | Altitude    | 613km                                | 666km                                |
|                         | Inclination | 98deg                                | 98deg                                |
|                         | Repeat      | 6 days (89 revol.)                   | 3 days (44 revol.)                   |
| Launch                  | Vehicle     | H-IIA                                | H-IIA                                |
|                         | Schedule    | JFY2018                              | 23 Jan., 2009                        |

## 2-a. TANSO-FTS-2 Specifications

| Items                                            | GOSAT-2                                                                                                                                                                                                                                                       | GOSAT                                                                                                                                   |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Measurement Gases                                | CO <sub>2</sub> , CH <sub>4</sub> , O <sub>3</sub> , H <sub>2</sub> O, <b>CO</b>                                                                                                                                                                              | CO <sub>2</sub> , CH <sub>4</sub> , O <sub>3</sub> , H <sub>2</sub> O                                                                   |
| Footprint size (FOV)                             | <b>9.7 km<math>\phi</math></b> (15.8mrad)                                                                                                                                                                                                                     | 10.5 km $\phi$ (15.8mrad)                                                                                                               |
| Spectral Ranges<br>( $\mu$ m)(cm <sup>-1</sup> ) | band 1 : 0.75-0.77 ( <b>12,950-13,250</b> )<br>band 2: 1.56- <b>1.69</b> ( <b>5,900</b> -6,400)<br>band 3: 1.92- <b>2.33</b> ( <b>4,200</b> -5,200)<br>band 4: 5.5- <b>8.4</b> ( <b>1,188-1,800</b> )<br>band 5: <b>8.4</b> -14.3 ( <b>700-1,188</b> )        | band 1: 0.75-0.77 (12,900-13,200)<br>band 2: 1.56-1.72 (5,800-6,400)<br>band 3: 1.92-2.08 (4,800-5,200)<br>band 4: 5.5-14.3 (700-1,800) |
| SNR                                              | band 1: <b>&gt;400</b> (S@13,050cm <sup>-1</sup> )<br>band 2: >300 (S@6,200cm <sup>-1</sup> )<br>band 3: >300 (S@5,000cm <sup>-1</sup> )<br>>250 (S@4,250cm <sup>-1</sup> )<br>band 4: >300 (@1,300cm <sup>-1</sup> )<br>band 5: >300 (@700cm <sup>-1</sup> ) | band 1: >300 (345)<br>band 2: >300 (322)<br>band 3: >300 (412)<br>band 4: >300 (304)                                                    |
| Observation Mesh                                 | 160km (5 points in the CT direction)                                                                                                                                                                                                                          | 160km (5 points in the CT direction)                                                                                                    |
| Scan duration                                    | <b>4 seconds / interferogram</b>                                                                                                                                                                                                                              | 4, 2, 1.1 seconds / interferogram                                                                                                       |
| Sampling resolution                              | 0.2cm <sup>-1</sup>                                                                                                                                                                                                                                           | 0.2cm <sup>-1</sup>                                                                                                                     |
| Effective Aperture size                          | <b>Φ73mm</b>                                                                                                                                                                                                                                                  | Φ64mm                                                                                                                                   |
| Gain steps                                       | <b>16</b>                                                                                                                                                                                                                                                     | 2                                                                                                                                       |
| Avoidance of the cloud                           | <b>Intelligent pointing</b>                                                                                                                                                                                                                                   | -----                                                                                                                                   |

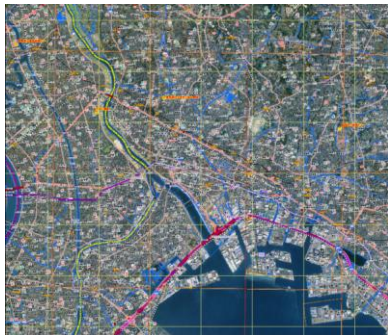
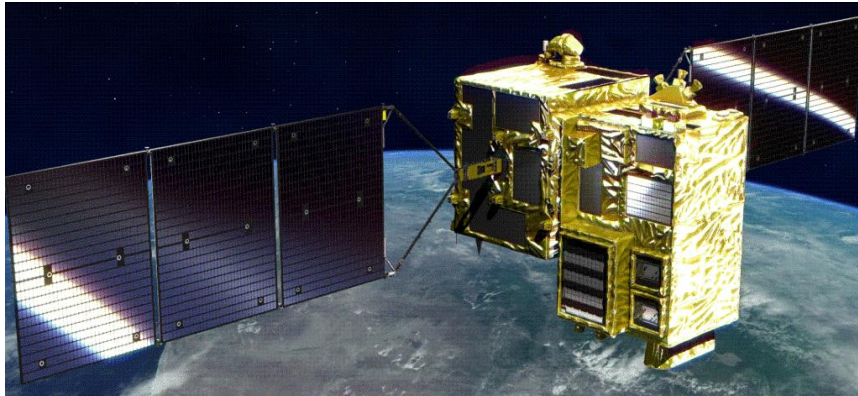
## 2-b. TANSO-CAI-2 Specifications

| Items                                                            |       | GOSAT-2                                                                   |                           | GOSAT                                               |
|------------------------------------------------------------------|-------|---------------------------------------------------------------------------|---------------------------|-----------------------------------------------------|
| Spectral Ranges (nm)                                             |       | Forward Viewing (+20 deg)                                                 | Backward Viewing (-20deg) | <b>Nadir Viewing</b>                                |
|                                                                  |       | <b>b 1 : 333-353</b>                                                      | b 6 : 370-390             | band 1 : 370-390                                    |
|                                                                  |       | <b>b 2 : 433-453</b>                                                      | <b>b 7 : 540-560</b>      |                                                     |
|                                                                  |       | <b>b 3 : 664-684</b>                                                      | <b>b 8 : 664-684</b>      | band 2 : 664-684                                    |
|                                                                  |       | <b>b 4 : 859-879</b>                                                      | <b>b 9 : 859-879</b>      | band 3 : 860-880                                    |
|                                                                  |       | <b>b 5 : 1585-1675</b>                                                    | <b>b 10 : 1555-1645</b>   | band 4 : 1555-1645                                  |
| Spatial Resolution                                               |       | except band 5, 10                                                         | band 5, 10                | Band 1-3 Band 4                                     |
|                                                                  | nadir | 460m (700μrad)                                                            | 920m(1,400μrad)           | 500m(750μrad) 1,500m(2,250μrad)                     |
| swath/FOV                                                        |       | every points on the earth to be observed at least twice a recurrent cycle |                           | Band 1-3 Band 4<br>1,002 km / 72 deg 786km / 60 deg |
| SNR (@spectral-radiance/albedo)<br><br>(W/m <sup>2</sup> /sr/μm) |       | b 1 : >200 (45/0.158)                                                     | b 6 : >200 (48/0.152)     | b 1 : >200 (47/0.149)                               |
|                                                                  |       | b 2 : >200 (79/0.144)                                                     | b 7 : >200 (65/0.125)     |                                                     |
|                                                                  |       | b 3 : >200 (46/0.106)                                                     | b 8 : >200 (46/0.106)     | b 2 : >200 (45/0.104)                               |
|                                                                  |       | b 4 : >200 (30/0.112)                                                     | b 9 : >200 (30/0.112)     | b 3 : >200 (29/0.108)                               |
|                                                                  |       | b 5 : >200 (7/0.101)                                                      | b 10 : >200 (7/0.101)     | b 4 : >200 (7/0.101)                                |



# 3. ALOS-2 follow-on

## Advanced Optical Satellite



### Hazard Map

Pan: 0.8 m

Mu: 6 bands, 3.2 m

Swath: 70 km

Recurrent: 35 days

LST: 10:30am

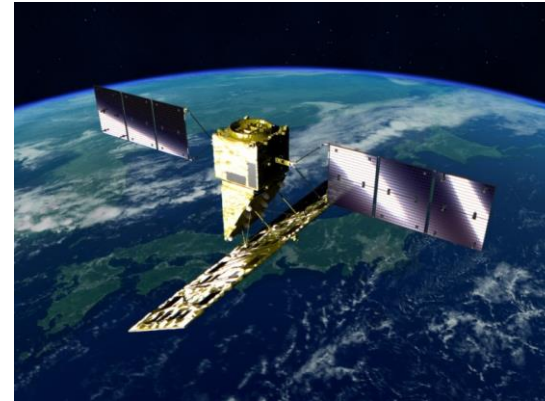
**Launch: to be in JFY2020**



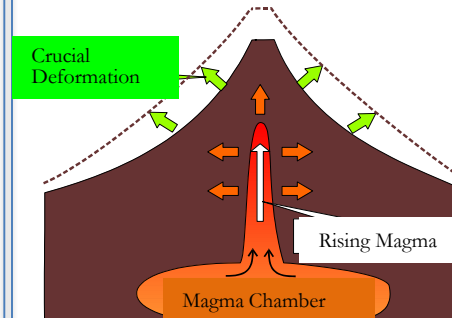
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Precise 1/25,000 Map

## Advanced SAR Satellite

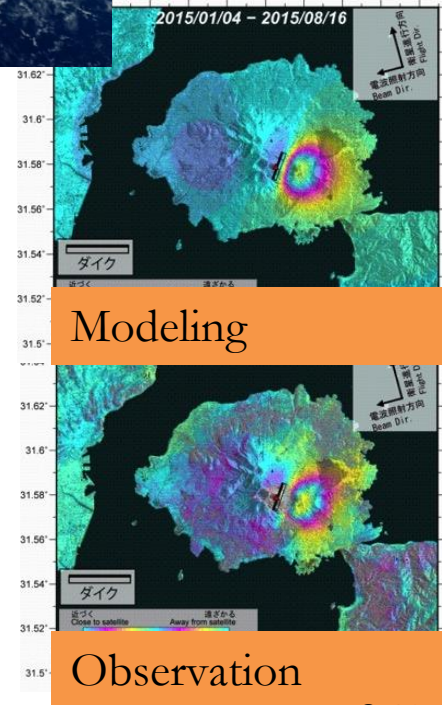


(Configuration is TBD)



Estimate situation of magma chamber under the ground and faulting

Take a decision for evacuation



Modeling

Observation

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