



# Report on the status of current and future satellite systems

Peng ZHANG

National Satellite Meteorological Center ,CMA

July 8-12, Tsukuba, Japan



# Outline

---

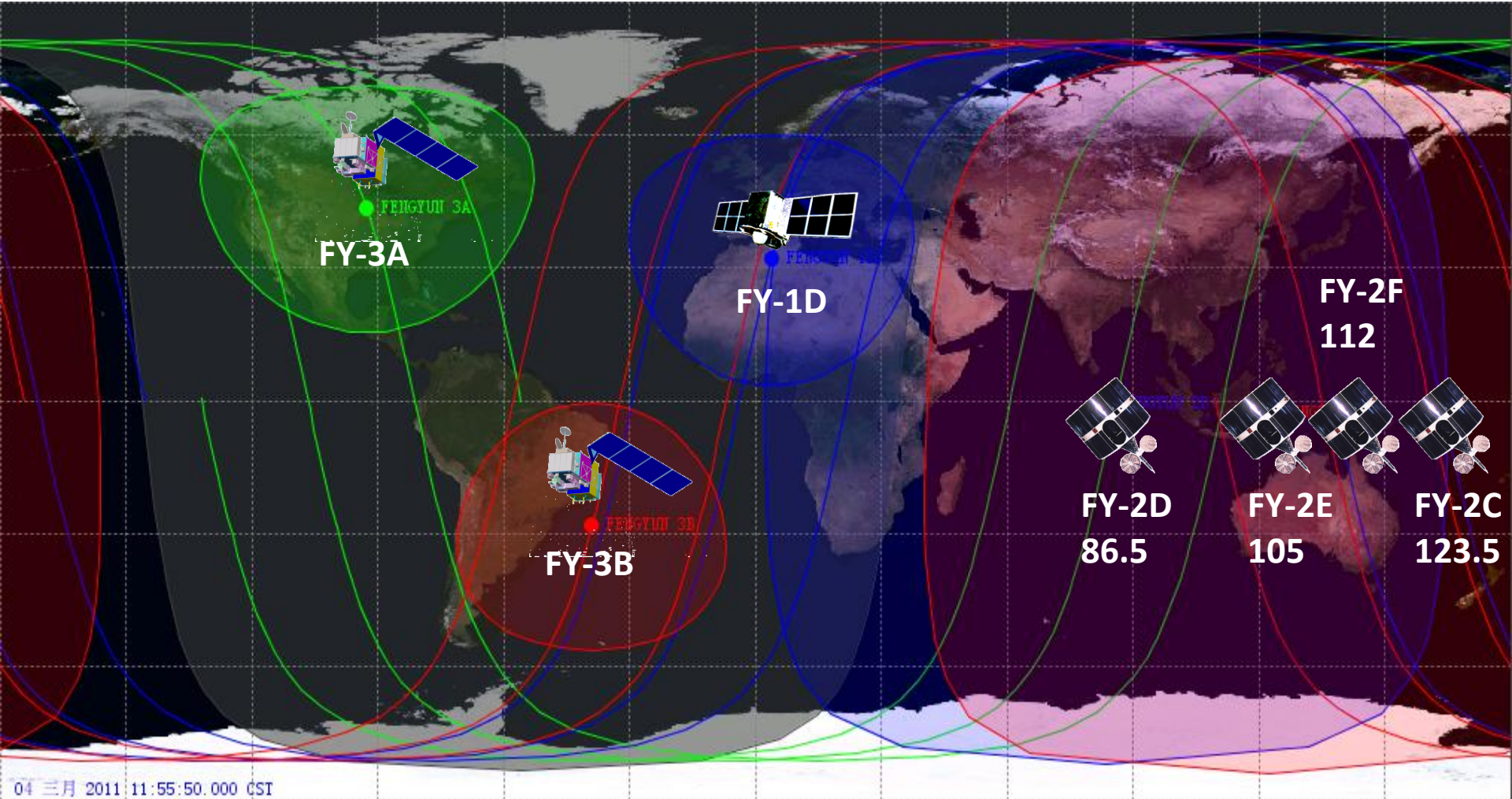
- Current Status
- Future Plan
- Latest Progress of FY-3C



# 1. Current Status



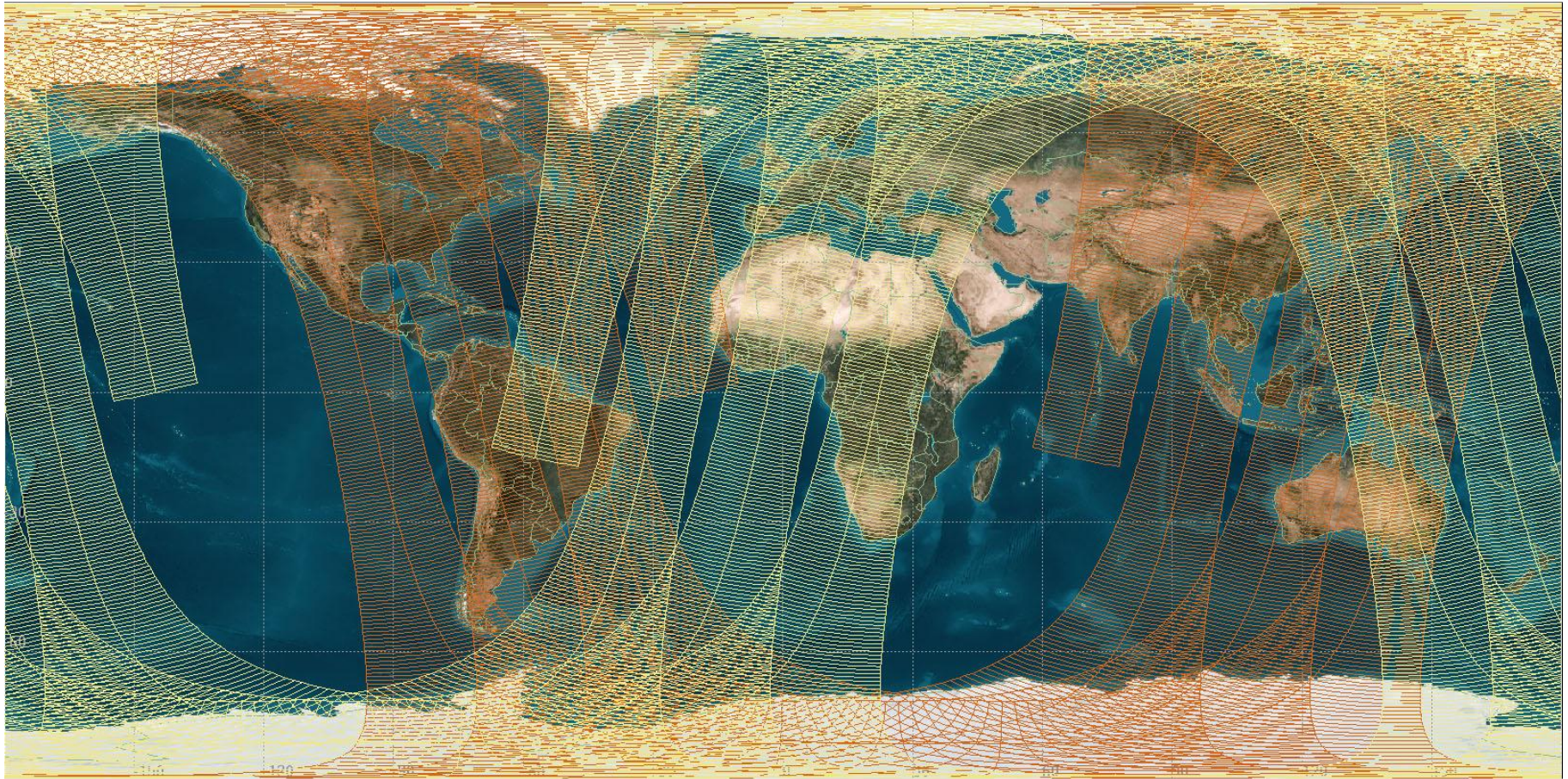
## On Orbit Satellite





# Fengyun Polar



- Retired: FY-1D
- In operation: FY-3A + FY-3B



 **FY-3A LTC 10:00 AM**

 **FY-3B LTC 13:40 PM**

# Instruments Status

| Instrument   | Status                          |                                 |
|--------------|---------------------------------|---------------------------------|
|              | FY-3A                           | FY-3B                           |
| <b>VIRR</b>  | Operating normally              | Operating normally              |
| <b>MERSI</b> | Operating normally              | Operating normally              |
| <b>IRAS</b>  | Failed to work since Oct., 2008 | Operating normally              |
| <b>MWTS</b>  | Failed to work since Dec., 2012 | Operating normally              |
| <b>MWHS</b>  | Operating normally              | Operating normally              |
| <b>MWRI</b>  | Stop to work after launch       | Operating normally              |
| <b>TOU</b>   | Operating normally              | Operating normally              |
| <b>SBUS</b>  | Failed to work since Dec., 2008 | Operating normally              |
| <b>ERM</b>   | Failed to work since May, 2010  | Failed to work since Aug., 2011 |
| <b>SIM</b>   | Operating normally              | Operating normally              |
| <b>SEM</b>   | Operating normally              | Operating normally              |

# Fengyun GEO



## ■ Retired

FY-2C

## ■ In operation

FY-2D: Full Disk

FY-2E: Full Disk

FY-2F: Regional

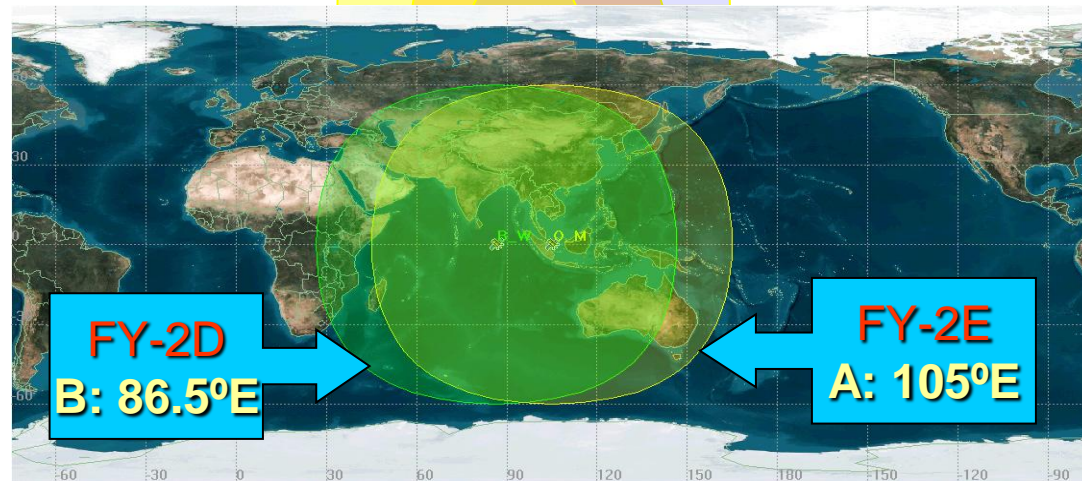
Operation

Back-up

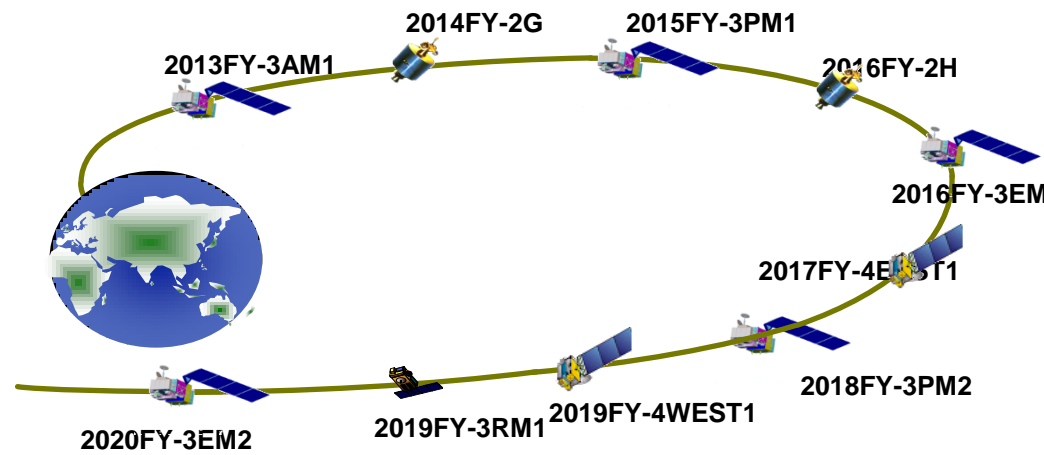


Full Disk Scan

Regional Scan



# 2. Future Plan



## Tentative Schedule for Future FY Series

| Schedule | GEO.        |                           | LEO.                            |
|----------|-------------|---------------------------|---------------------------------|
|          | FY-2        | FY-4                      | FY-3                            |
| 2011     |             |                           |                                 |
| 2012     |             |                           |                                 |
| 2013     |             |                           | Operational (A.M. Orbit)        |
| 2014     | Operational |                           |                                 |
| 2015     |             |                           | Operational (P.M. Orbit)        |
| 2016     | Operational |                           | Operational (E.M. Orbit)        |
| 2017     |             | Operational (Optical SAT) |                                 |
| 2018     |             |                           | Operational (P.M. Orbit)        |
| 2019     |             | Operational (Optical SAT) | Operational (Rain Fall Mission) |
| 2020     |             |                           | Operational (E.M. Orbit)        |

# FY-3A/B follow-on



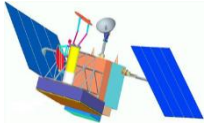
| FY-3 OPERATIONAL SATELLITE INSTRUMENTS             | FY-3C | FY-3D | FY-3E | FY-3F |
|--|-------|-------|-------|-------|
| MERSI – Medium Resolution Spectral Imager (I, II)  | √(I)  | √(II) | TBD   | √(II) |
| MWTS – Microwave Temperature Sounder (II)          | √     | √     | √     | √     |
| MWHS – Microwave Humidity Sounder (II)             | √     | √     | √     | √     |
| MWRI – Microwave Radiation Imager                  | √     | √     |       | √     |
| WindRAD - Wind Radar                               |       |       | √     |       |
| GAS - Greenhouse Gases Absorption Spectromete      |       | √     |       | √     |
| HIRAS – Hyperspectral Infrared Atmospheric Sounder |       | √     | √     | √     |
| OMS – Ozone Mapping Spectrometer                   |       |       |       |       |
| GNOS – GNSS Occultation Sounder                    | √     | √     | √     | √     |
| ERM – Earth Radiation Measurement (I, II)          | √(I)  |       |       |       |
| SIM – Solar irradiation Monitor (II)               | √     |       |       |       |
| SES – Space Environment Suite                      | √     | √     | √     | √     |
| IRAS – Infrared Atmospheric Sounder                | √     |       |       |       |
| VIRR – visible and Infrared Radiometer             | √     |       |       |       |
| SBUS – Solar Backscattered Ultraviolet Sounder     | √     |       |       |       |
| TOU – Total Ozone Unit                             | √     |       |       |       |

FY-3 series is expected to last its measurements at least 15 years with additional four satellites. There are 16 improved or new instruments will be configured from FY-3C to FY-3F in the schedule.

**FY-3C/D/E/F Payload Configuration**

↑ 2016





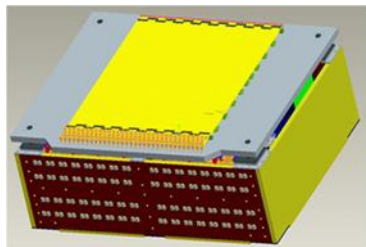
# FY-3 Rain Fall Mission



- Consist a Global observation constellation system with FY3-2 AM and PM satellites, as well as GPM satellite
- Improve the severe convective system monitoring ability in china together with GPM satellite
- Provide 3D precipitation structure over both ocean and land
- Improve the sensitivity and accuracy of precipitation measurement over china and surrounding area



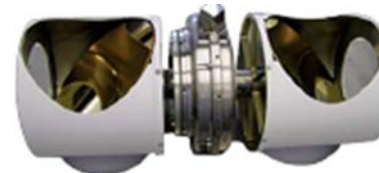
MWTS



KaPR



KuPR

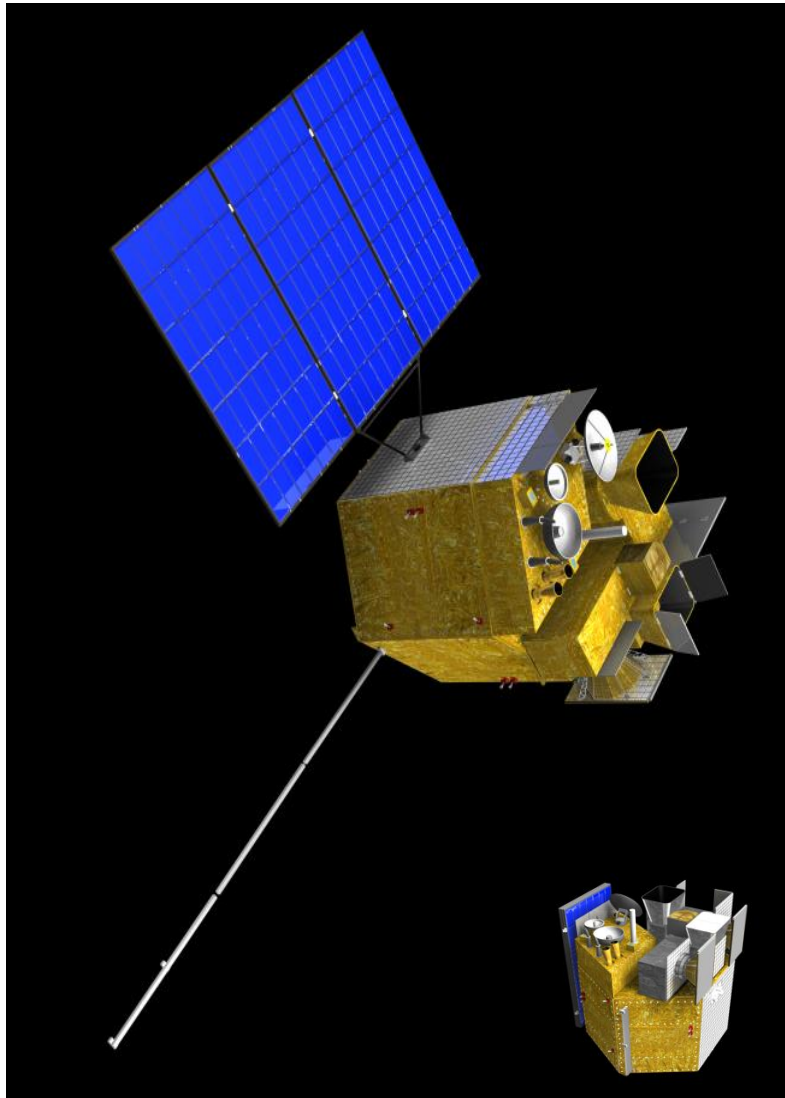


MWHS



MWRI

# FY-4 Optical SAT



## Main Instruments

- 1) **GIIRS**: Geo. Interferometric Infrared Sounder
- 2) **AGRI**: Advanced Geosynchronous Radiation Imager
- 3) **LMI**: Lightning Mapping Imager
- 4) **SEP**: Space Environment Package

## Spacecraft:

1. Launch Weight: approx 5300kg
2. Stabilization: Three-axis
3. Attitude accuracy: 3"
4. Bus: 1553B+Spacewire
5. Raw data transmission : X band
6. Output power:  $\geq 3200W$

# 3. Latest Progress of FY-3C

---



- Launch date has been fixed: Sept. 23 ~ 24, 2013

- New Instrument

**GNOS**

- Improved Instrument

**MWTS II** :4 channels to 13 channels

**MWHS II** : 5 channels to 15 channels, 15 pixels per line to 90 pixels per line

**SIM II** : without the solar tracking function to with the solar tracking function

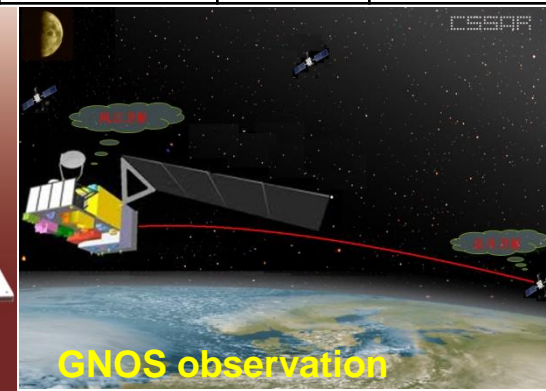
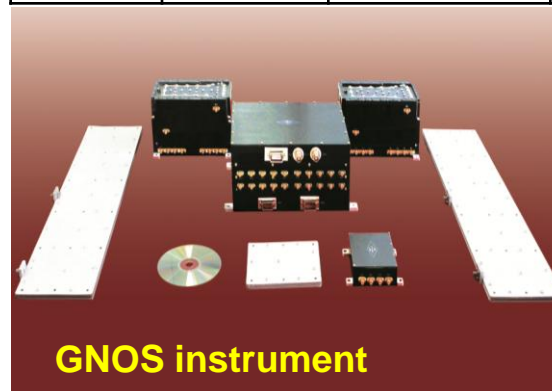
GNOS will receive two types of signal from GPS and China BeiDou-2. GNOS will observe over 1000 occultations per day with GPS and BD satellites,

## Expected Products

- Temperature profiles
- Humidity profiles
- Refractivity profiles
- Electronic content profiles

|                              |                                   |
|------------------------------|-----------------------------------|
| <b>Frequency</b>             | GPS L1/L2; BD2                    |
| <b>Receiver Channels</b>     | 8 (Navigation)<br>4 (Occultation) |
| <b>Sampling rate</b>         | 1 ~ 50 Hz                         |
| <b>Crystal oscillator</b>    | 1e-11 (100s)                      |
| <b>Real-time position</b>    | 10m (RMS)                         |
| <b>Real-time velocity</b>    | 0.1m/s(RMS)                       |
| <b>Phase center accuracy</b> | 2 mm (RMS)                        |
| <b>Antenna number</b>        | 1 (Navigation)<br>2 (Occultation) |

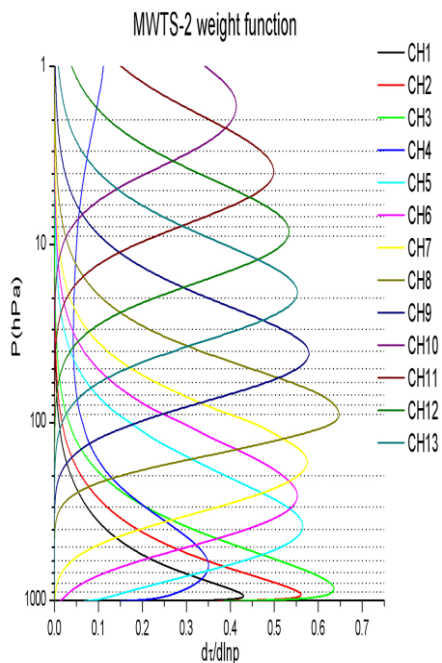
|                         |               | Temperature | Humidity      | Refracti<br>vity | Electronic<br>Content |
|-------------------------|---------------|-------------|---------------|------------------|-----------------------|
| <b>RMS<br/>Accuracy</b> | Low Tropos.   | 0.5-3 k     | 0.25-1.0 g/kg | 0.1-0.5%         | (100-600 km)<br>< 20% |
|                         | High Tropos.  | 0.5-3 k     | 0.05-0.2 g/kg | 0.1-0.2%         |                       |
|                         | Low Stratos.  | 0.5-3 k     | -----         | 0.1-0.2%         |                       |
|                         | High Stratos. | 0.5-5 k     | -----         | 0.2-2.0%         |                       |





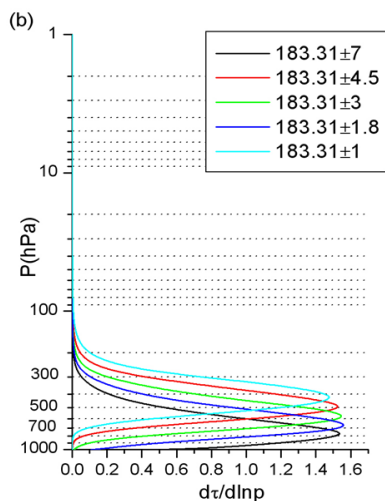
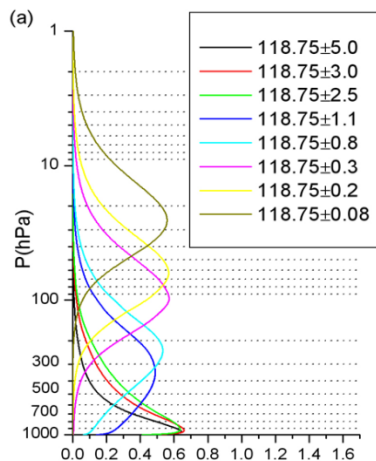
| Parameter            | Specification    |
|----------------------|------------------|
| Scan Angle           | $\pm 49.5^\circ$ |
| Pixels Per Scan Line | 90               |
| Quantization         | 13 bits          |

| Ch No. | Central Frequency (GHz)     | 3dB Bandwidth (MHz) | NEAT (K) | Main Beam Eff. | Dynamic Range (K) | Cal. Acc. (K) | Purpose                         |
|--------|-----------------------------|---------------------|----------|----------------|-------------------|---------------|---------------------------------|
| 1      | 50.3                        | 180                 | 1.20     | >90%           | 3 ~ 340           | 1.5           | Surface Emiss.                  |
| 2      | 51.76                       | 400                 | 0.75     | >90%           | 3 ~ 340           | 1.5           | Atmospheric Temperature Profile |
| 3      | 52.8                        | 400                 | 0.75     | >90%           | 3 ~ 340           | 1.5           |                                 |
| 4      | 53.596                      | 400                 | 0.75     | >90%           | 3 ~ 340           | 1.5           |                                 |
| 5      | 54.40                       | 400                 | 0.75     | >90%           | 3 ~ 340           | 1.5           |                                 |
| 6      | 54.94                       | 400                 | 0.75     | >90%           | 3 ~ 340           | 1.5           |                                 |
| 7      | 55.50                       | 330                 | 0.75     | >90%           | 3 ~ 340           | 1.5           |                                 |
| 8      | $57.290344 (f_0)$           | 330                 | 0.75     | >90%           | 3 ~ 340           | 1.5           |                                 |
| 9      | $f_0 \pm 0.217$             | 78                  | 1.20     | >90%           | 3 ~ 340           | 1.5           |                                 |
| 10     | $f_0 \pm 0.3222 \pm 0.048$  | 36                  | 1.20     | >90%           | 3 ~ 340           | 1.5           |                                 |
| 11     | $f_0 \pm 0.3222 \pm 0.022$  | 16                  | 1.70     | >90%           | 3 ~ 340           | 1.5           |                                 |
| 12     | $f_0 \pm 0.3222 \pm 0.010$  | 8                   | 2.40     | >90%           | 3 ~ 340           | 1.5           |                                 |
| 13     | $f_0 \pm 0.3222 \pm 0.0045$ | 3                   | 3.60     | >90%           | 3 ~ 340           | 1.5           |                                 |

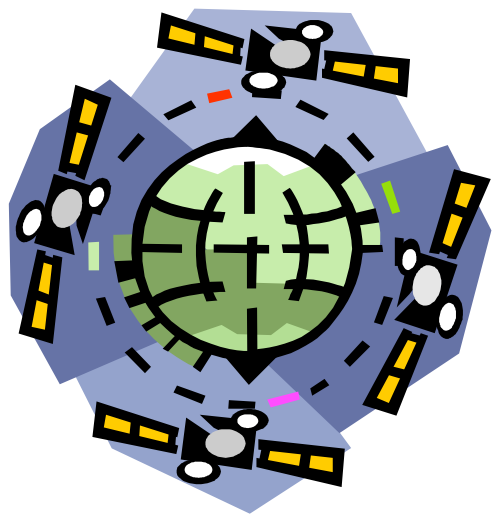




| Parameter            | Specification     |
|----------------------|-------------------|
| Scan Angle           | $\pm 53.35^\circ$ |
| Pixels Per Scan Line | 98                |
| Quantization         | 14 bits           |



| Ch No. | Central Frequency (GHz) | Polarization | Bandwidth (MHz) | Freq. Stability (MHz) | Dynamic Range (K) | NE $\Delta T$ (K) | Cal. Acc. (K) | Main Beam Width | Main Beam Eff. | Purpose                         |
|--------|-------------------------|--------------|-----------------|-----------------------|-------------------|-------------------|---------------|-----------------|----------------|---------------------------------|
| 1      | 89.0                    | V            | 1500            | 50                    | 3-340             | 1.0               | 1.3           | 2.0°            | >92%           | Surface and Precipitation       |
| 2      | 118.75 $\pm$ 0.08       | H            | 20              | 30                    | 3-340             | 3.6               | 2.0           | 2.0°            | >92%           | Atmospheric Temperature Profile |
| 3      | 118.75 $\pm$ 0.2        | H            | 100             | 30                    | 3-340             | 2.0               | 2.0           | 2.0°            | >92%           |                                 |
| 4      | 118.75 $\pm$ 0.3        | H            | 165             | 30                    | 3-340             | 1.6               | 2.0           | 2.0°            | >92%           |                                 |
| 5      | 118.75 $\pm$ 0.8        | H            | 200             | 30                    | 3-340             | 1.6               | 2.0           | 2.0°            | >92%           |                                 |
| 6      | 118.75 $\pm$ 1.1        | H            | 200             | 30                    | 3-340             | 1.6               | 2.0           | 2.0°            | >92%           |                                 |
| 7      | 118.75 $\pm$ 2.5        | H            | 200             | 30                    | 3-340             | 1.6               | 2.0           | 2.0°            | >92%           |                                 |
| 8      | 118.75 $\pm$ 3.0        | H            | 1000            | 30                    | 3-340             | 1.0               | 2.0           | 2.0°            | >92%           |                                 |
| 9      | 118.75 $\pm$ 5.0        | H            | 2000            | 30                    | 3-340             | 1.0               | 2.0           | 2.0°            | >92%           |                                 |
| 10     | 150.0                   | V            | 1500            | 50                    | 3-340             | 1.0               | 1.3           | 1.1°            | >95%           | Surface and Precipitation       |
| 11     | 183.31 $\pm$ 1          | H            | 500             | 30                    | 3-340             | 1.0               | 1.3           | 1.1°            | >95%           | Atmospheric Moisture Profile    |
| 12     | 183.31 $\pm$ 1.8        | H            | 700             | 30                    | 3-340             | 1.0               | 1.3           | 1.1°            | >95%           |                                 |
| 13     | 183.31 $\pm$ 3          | H            | 1000            | 30                    | 3-340             | 1.0               | 1.3           | 1.1°            | >95%           |                                 |
| 14     | 183.31 $\pm$ 4.5        | H            | 2000            | 30                    | 3-340             | 1.0               | 1.3           | 1.1°            | >95%           |                                 |
| 15     | 183.31 $\pm$ 7          | H            | 2000            | 30                    | 3-340             | 1.0               | 1.3           | 1.1°            | >95%           |                                 |



Thank you!

