

# CMA updates since CGMS-51 and report on the medium to long-term future plans on Earth observation

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**China Meteorological Administration**

Presented to CGMS-52 Plenary session, agenda item 3

**GEO**

**FY-2G, -2H**

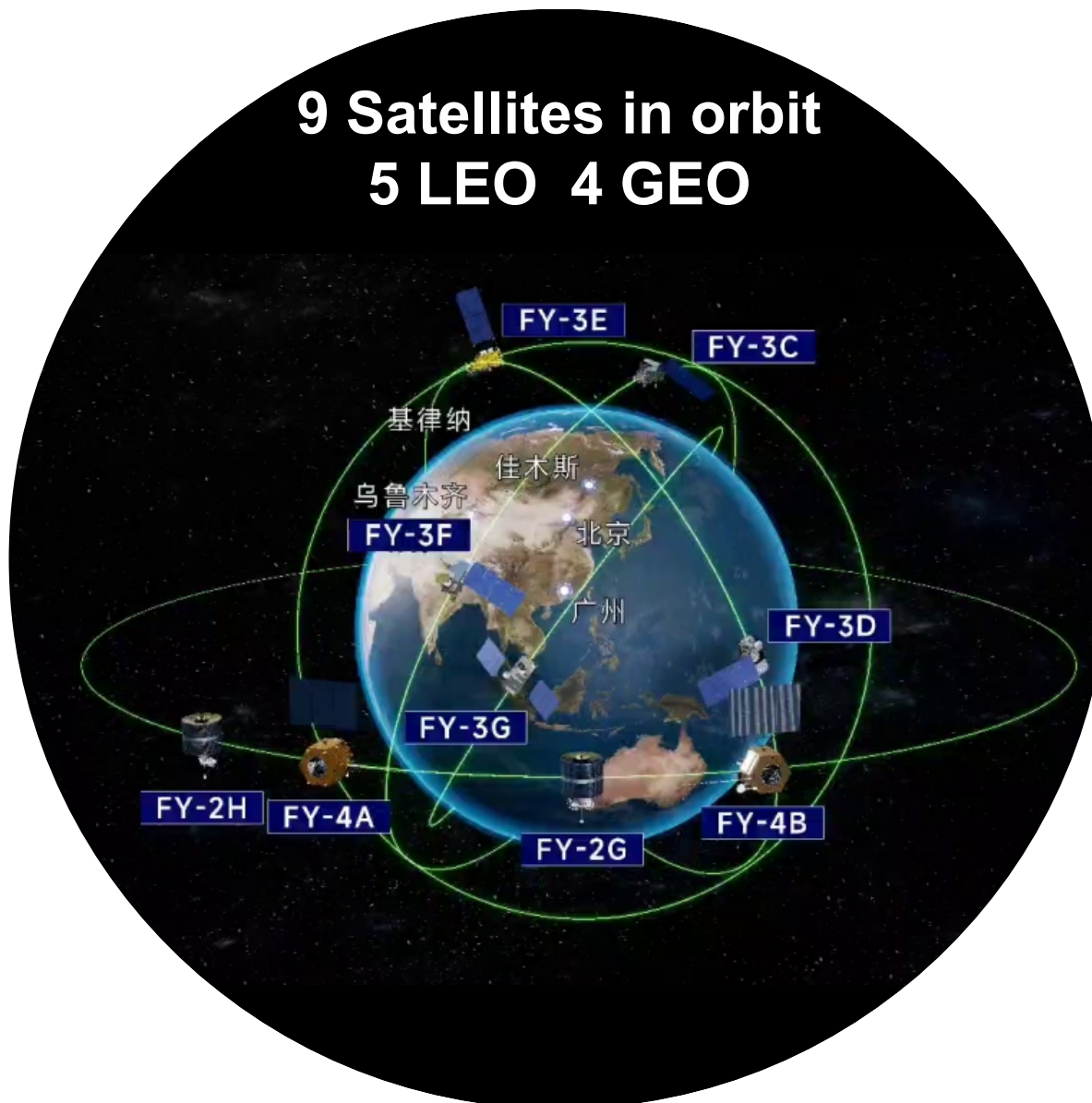
FY-2G (99.5°E ) and FY-2H (79°E)  
Full disk every 30 min  
FY-2H, last flight unit of FY-2 series.

**FY-4A**

FY-4A (105°E) , Full disk every 15 min.  
**Relocated to 86.5 °E during 5 to 22 Mar. 2024**

**FY-4B**

FY-4B (133°E), Full disk every 15 min, partial areas rapid scanning at 1 min.  
**Operational since 1<sup>st</sup> December 2022**  
**Relocated to 105 °E during 1st to 20 Feb. 2024.**



**LEO**

**FY-3C**

Mid-morning orbit  
Operational with degraded performance

**FY-3D**

Afternoon orbit, ECT 13:45 local time  
10 EO instruments

**FY-3E**

Early-morning orbit, ECT 5:41 local time  
11 EO instruments  
**Operational since 1 Dec. 2022**

**FY-3F**

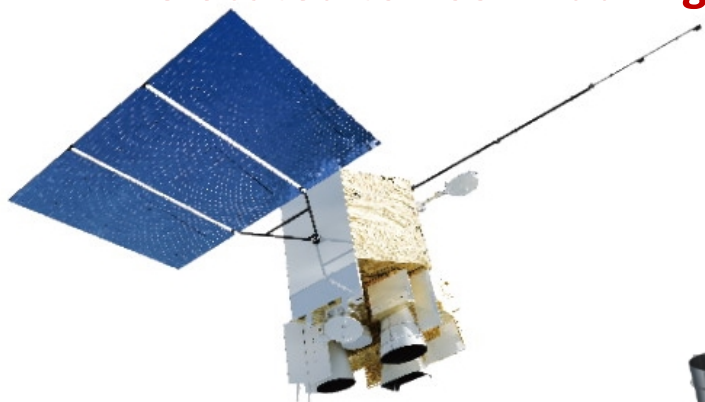
Mid-morning orbit  
10 EO instruments  
**Launched 3 Aug. 2023**

**FY-3G**

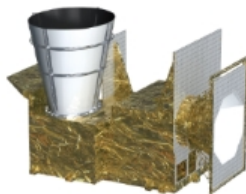
Drifting orbit  
6 EO instruments  
**Launched 16 Apr. 2023**  
In-orbit testing data released

# FY-4B

- ❑ FY-4B, the second satellite of FY-4 series, was designed to be **the first operational satellite** of FY-4 series and launched on June 3, 2021
- ❑ **Relocated to 105 °E during 1st to 20 Feb. 2024.**



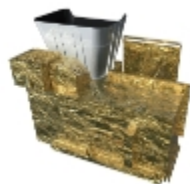
Geostationary High-speed Imager (GHI)



Geostationary Interferometric Infrared Sounder (GIIRS)

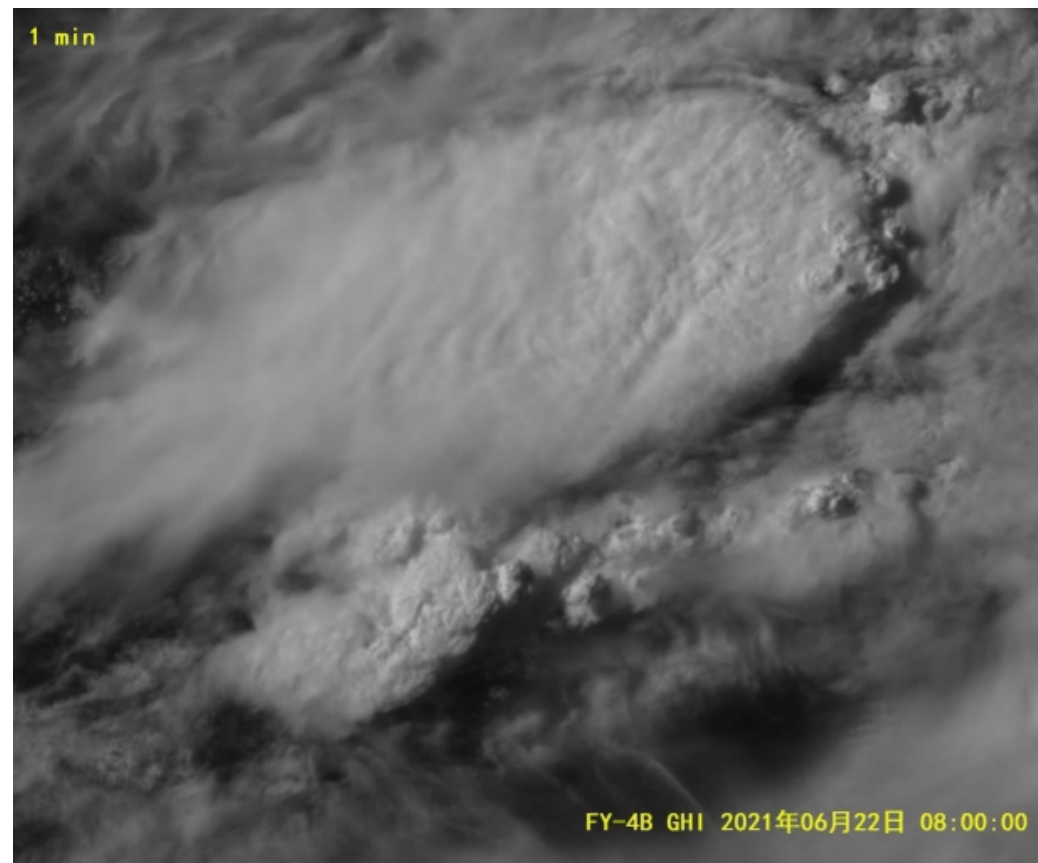


Space Environment Monitoring Instrument Package (SEP)



Advanced Geostationary Radiation Imager (AGRI)

**Coordination Group for Meteorological Satellites**



# Coordination Group for Meteorological Satellites - CGMS

## FY-3G

First precipitation measurement satellite in China

Successfully launched at 9:36 16 Apr. 2023.

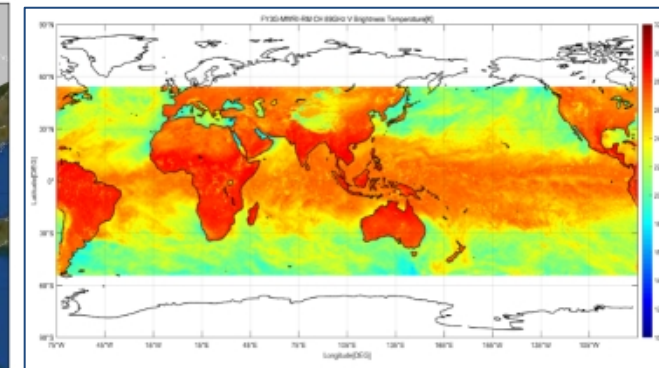
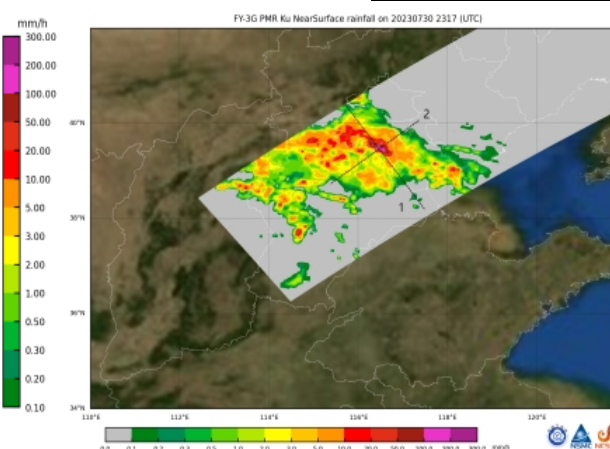
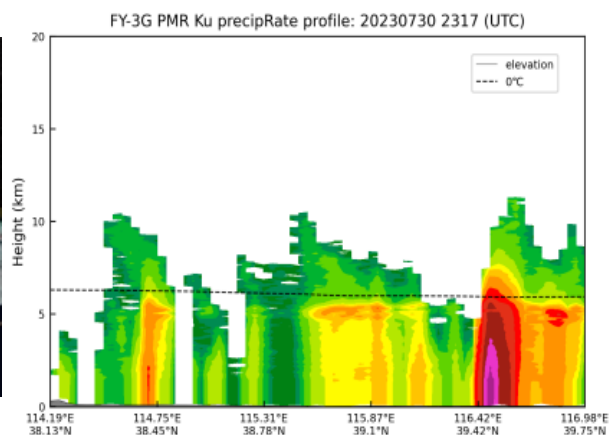
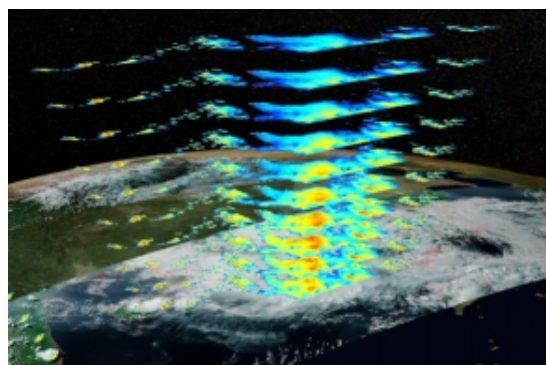
6 instruments: 3 new, 2 upgraded, 1 inherited

Simulated data released on 16 Apr. 2023

First image released on 15 May 2023

**FY-3G officially began operational services since 1st May 2024**

Instrument Name	Acronym
Precipitation Measurement Radar	PMR ★
GNSS Radio Occultation Sounder - 2	GNOS-2
MERSI-Rainfall Measurement	MERSI-RM
Micro-Wave Radiation Imager for the Rainfall Mission	MWRI-RM
High Accuracy On-board Calibrator	HAOC ★
Short-wave Infrared Polarized Multi-Angle Imager	PMAI ★

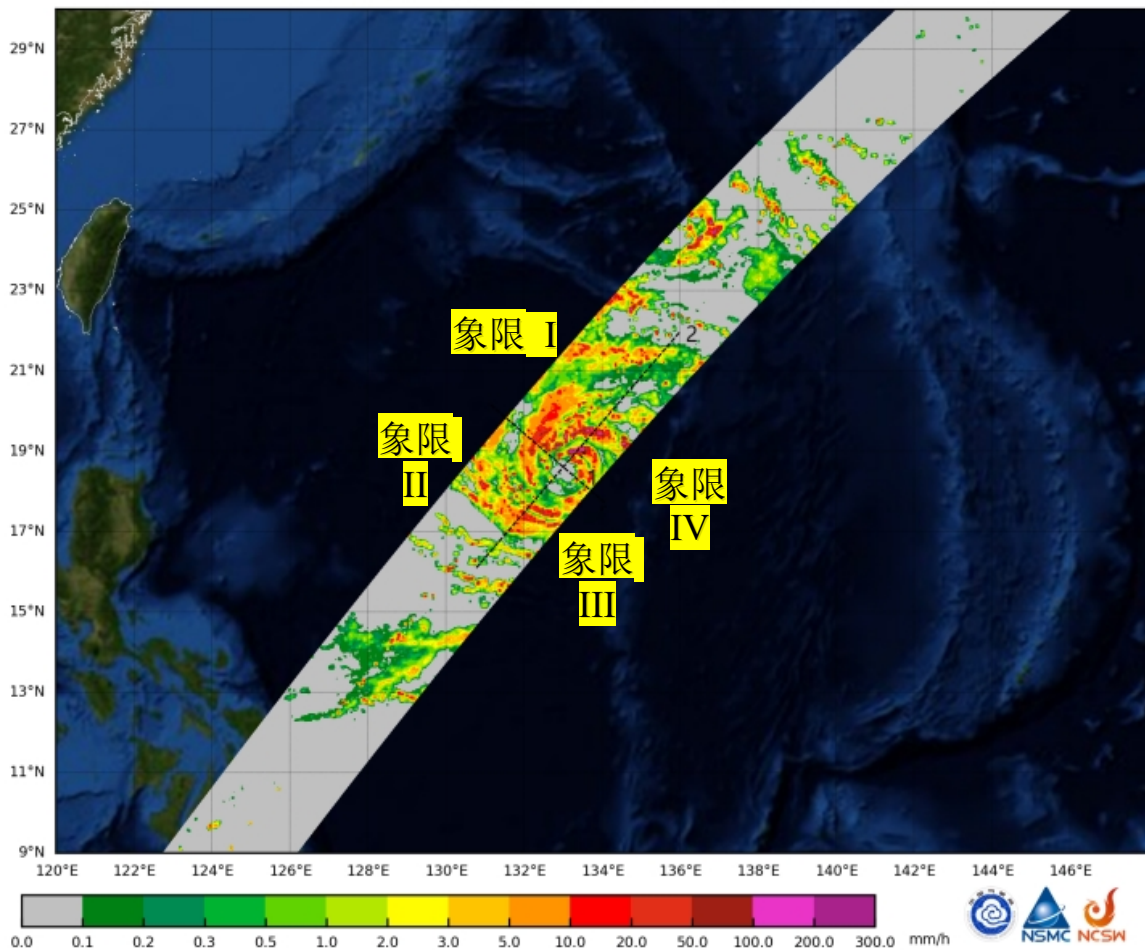




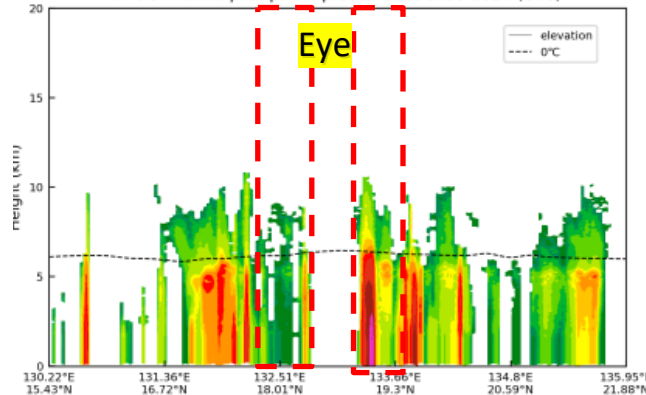
# Typhoon monitoring of FY-3G data:

The precipitation structure of the typhoon "Kanu", the sixth Western Pacific typhoon of 2023, detected by FY3G at 04:27 LST on the 30th July. From the figure, it can be seen that the precipitation structure of Kanu shows a **significant asymmetric structure** at this time, with strong convection close to the side of the subtropical high. The maximum rainfall intensity is located in **quadrants I and IV**, and the height of the rain top exceeds 10km. The cross sections of raindrop distribution (DSD) across the eye of typhoon show that the precipitation particles in the typhoon are small and dense which make a high precipitation efficiency.

FY-3G PMR Ku NearSurface rainfall on 20230729 2027 (UTC)

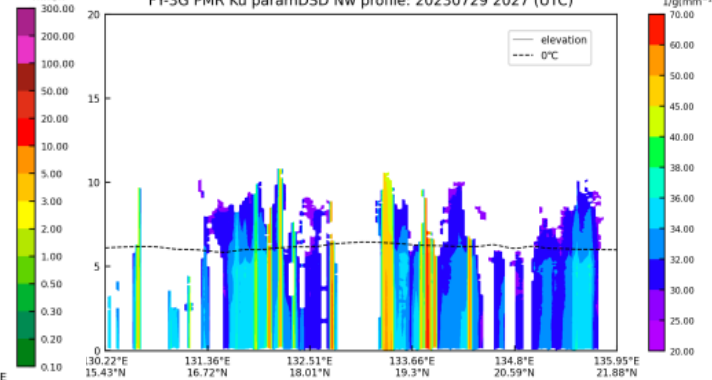


FY-3G PMR Ku precipRate profile: 20230729 2027 (UTC)



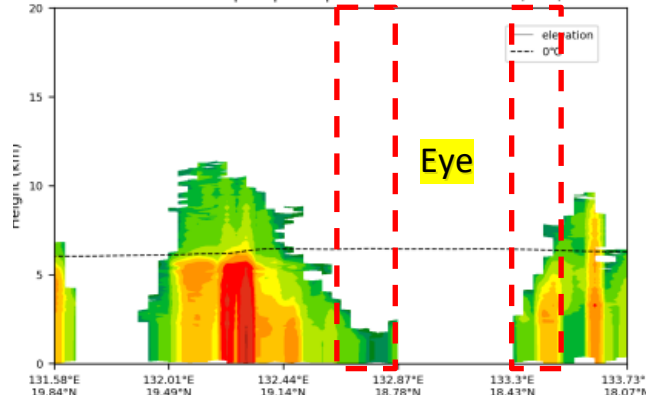
SouthWest

FY-3G PMR Ku paramDSD Nw profile: 20230729 2027 (UTC)



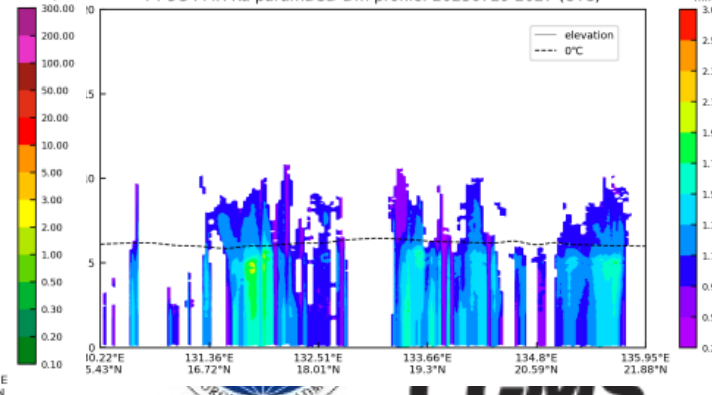
NorthEast

FY-3G PMR Ku precipRate profile: 20230729 2027 (UTC)



NorthWest

FY-3G PMR Ku paramDSD Dm profile: 20230729 2027 (UTC)



SouthEast

## FY-3F

a new morning orbit satellite

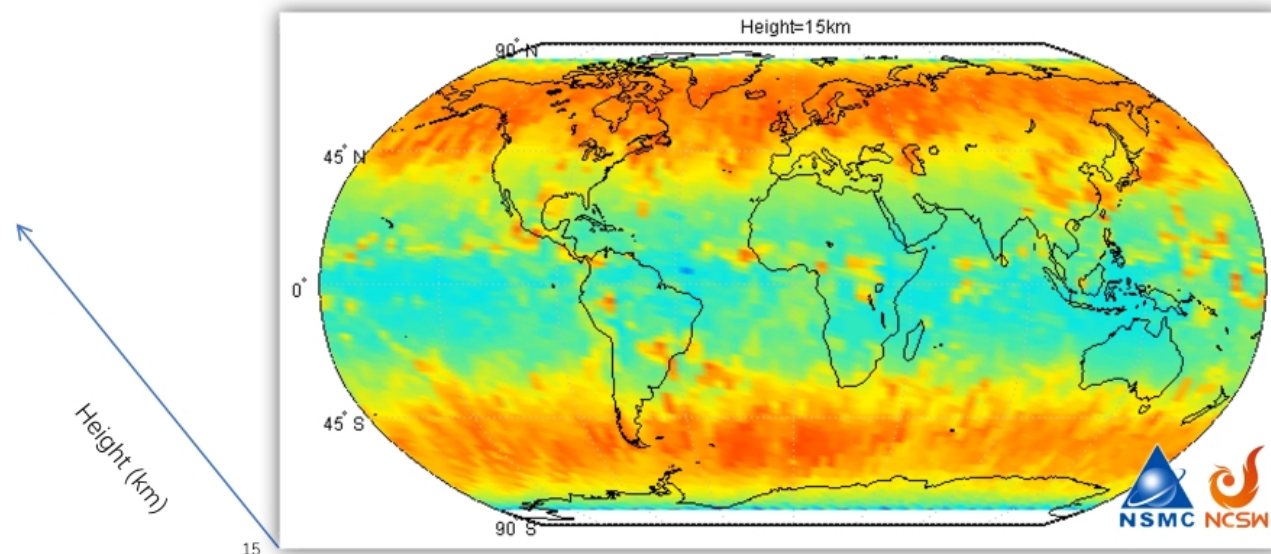
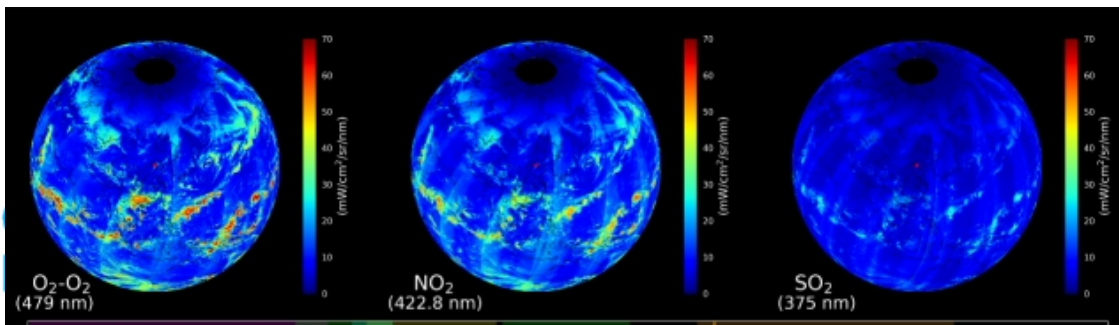
Successfully launched on 3<sup>rd</sup> Aug. 2023

10 instruments, including two new Ozone Monitoring Instruments integrated nadir and limb observation

**FY-3F in-orbit testing will complete at the end of June 2024, and switch to operation in July.**

Continue to provide 3D global atmospheric detection data for numerical weather prediction models with more than 50 products

Full name	Acronym
Micro-Wave Humidity Sounder -2	MWHS-2
Micro-Wave Temperature Sounder - 3	MWTS-3
Hyperspectral Infrared Atmospheric Sounder - 2	HIRAS-2
GNSS Radio Occultation Sounder - 2	GNOS-2
Ozone Monitoring Suite - nadir scanning unit	OMS-nadir
Ozone Monitoring Suite - limb scanning unit	OMS-limb
Medium Resolution Spectral Imager - 3	MERSI-3
Micro-Wave Radiation Imager 2	MWRI-2
Earth Radiation Measurement - 2	ERM-2
Solar Irradiance Monitor - 2	SIM-2



OMS-Limb Atmospheric Composition Sounding

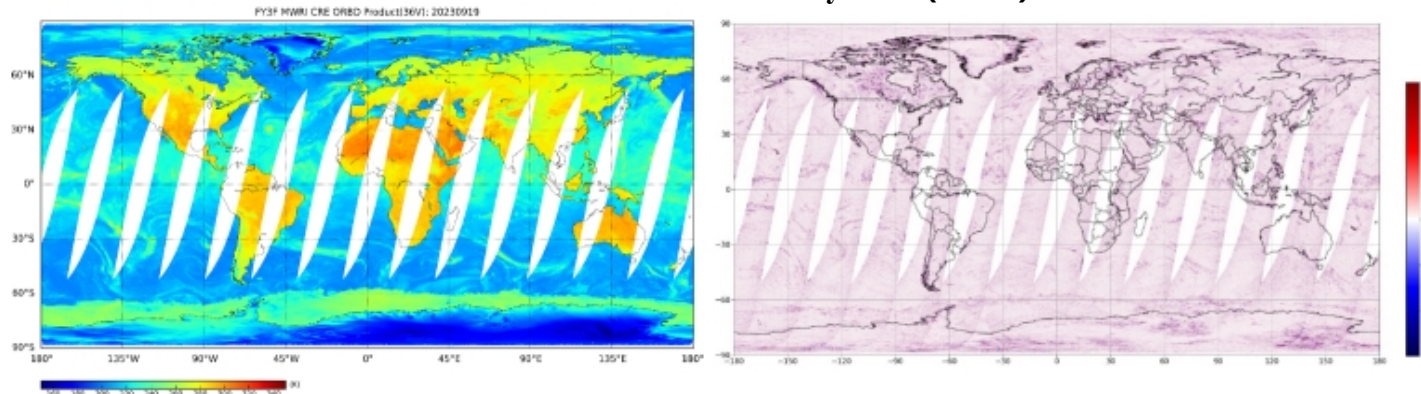
Ultraviolet Hyperspectral Atmospheric Composition Detection (left)



# Spatial Resolution Enhanced product for FY-3F MWRI-II

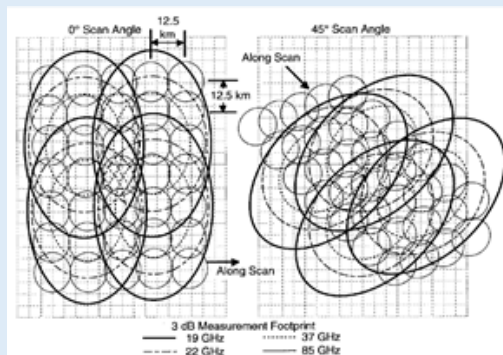
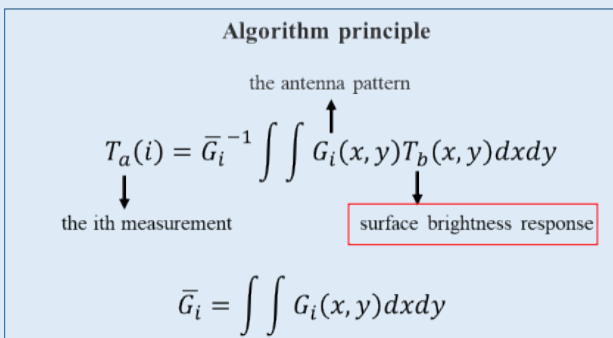
- FY-3F MWRI-II product of Channel Resolution Enhancing(CRE) has been generated by using Scatterometer Image Reconstruction (SIR) algorithm. This product can be used as input for other MWRI Level-2 products. Grid resolution of CRE is 1/4 of the sampling frequency.
- The RMSE between simulation results and true images is less than 1 K, and the mean error is around 0.04 K.

FY-3F MWRI-II product of Channel Resolution Enhancing(CRE) and deviation distribution for 2023 day 262 (36.5V)



## Scatterometer Image Reconstruction algorithm (SIR)

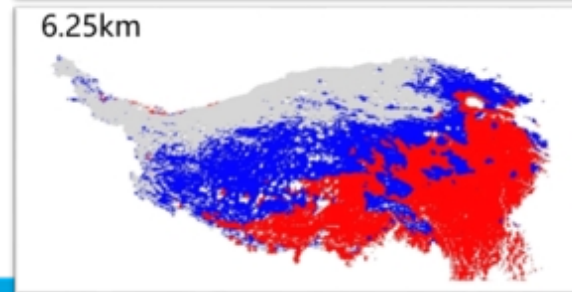
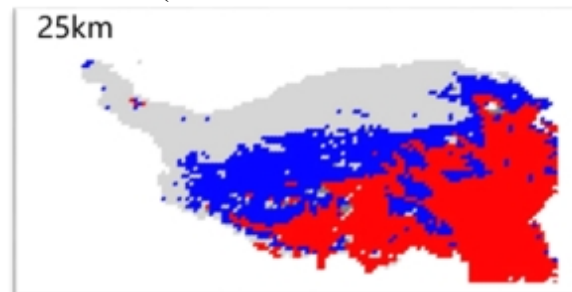
SIR algorithm depends on the sampling pattern and the overlap in the response functions of the measurements. In general, the higher the sampling density (leading to more overlap in the observation), the better the resolution enhancement.



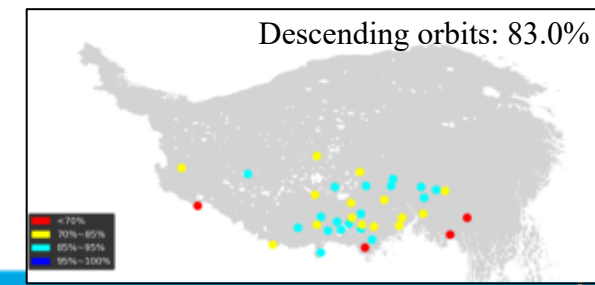
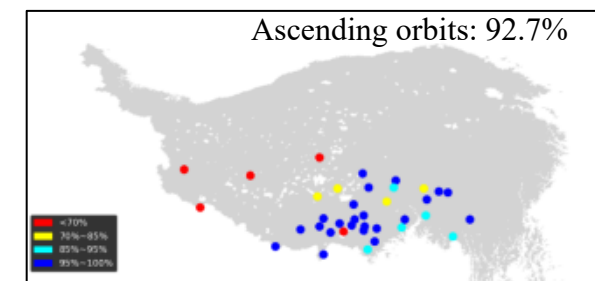
Geometry of the resolution-enhancement algorithm (David G. Long, et al. *IEEE*, 1998.)

## Application: Enhanced-resolution freeze/thaw state(6.25Km)

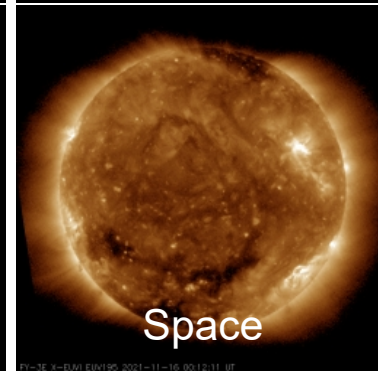
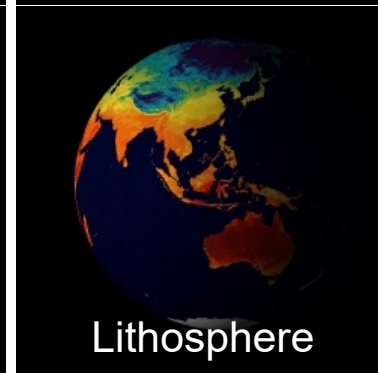
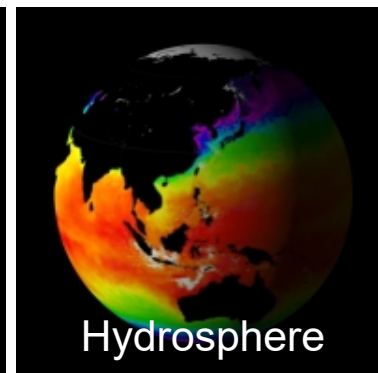
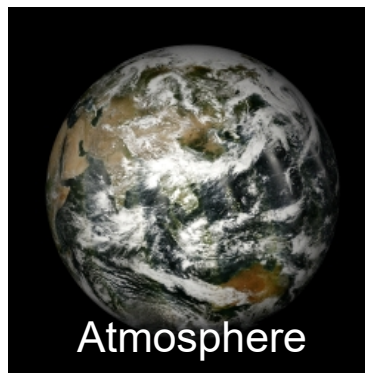
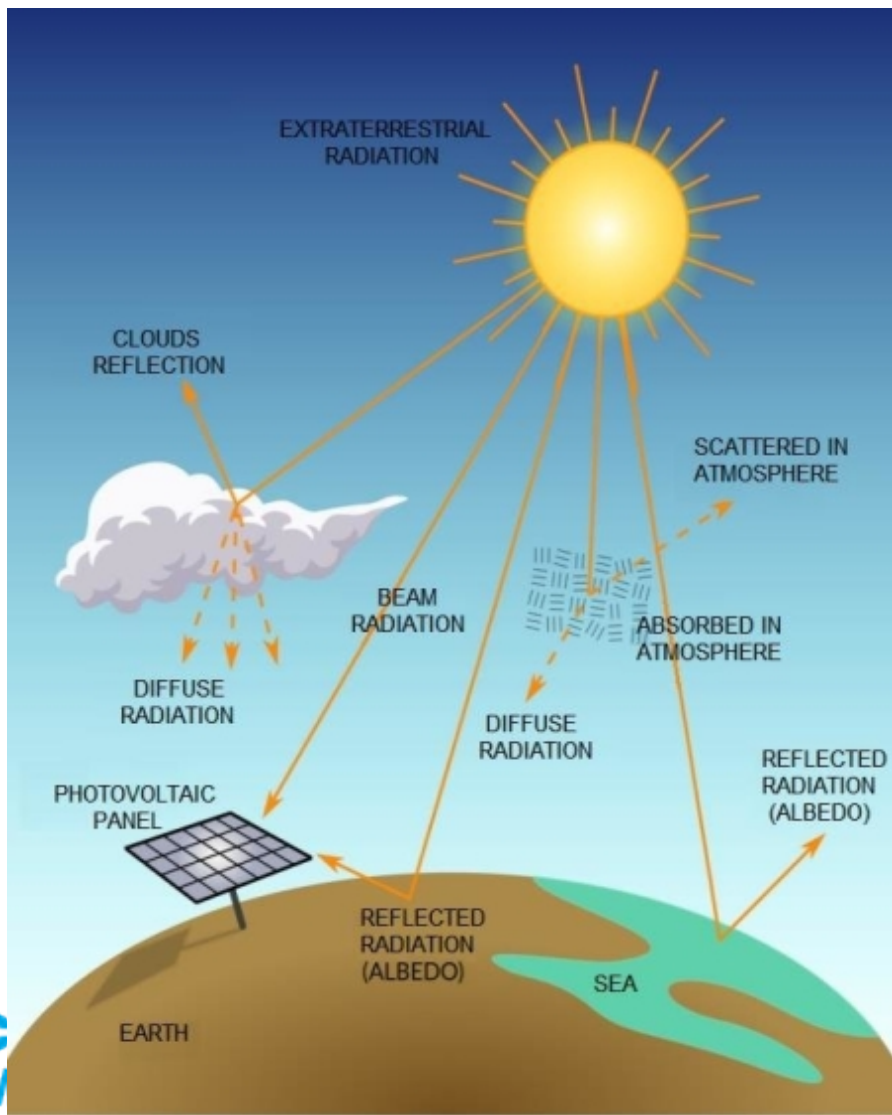
Comparison between results of 25km and 6.25km (2021.01.01-01.10)



Freeze/thaw state annual quality assurance map for 2021.



# FengYun satellite products



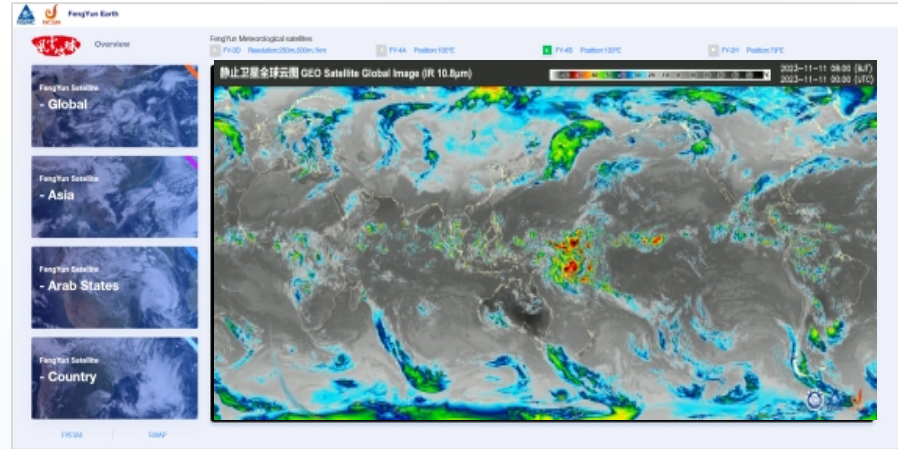
- Product List:
- Atmosphere(33)
  - Cloud & Radiation(17)
  - Space Weather(13)
  - Land(12)
  - Ocean(7)
  - Ice&Snow(4)
  - Biology(4)



# Application: FengYun Earth

## REAL TIME

The platform swiftly acquires data from a variety of sources, including meteorological satellites and numerical forecasts, enabling the rapid production of quantitative products and the prompt delivery of international services. Users can receive satellite images in an impressively short span of just 6 minutes.

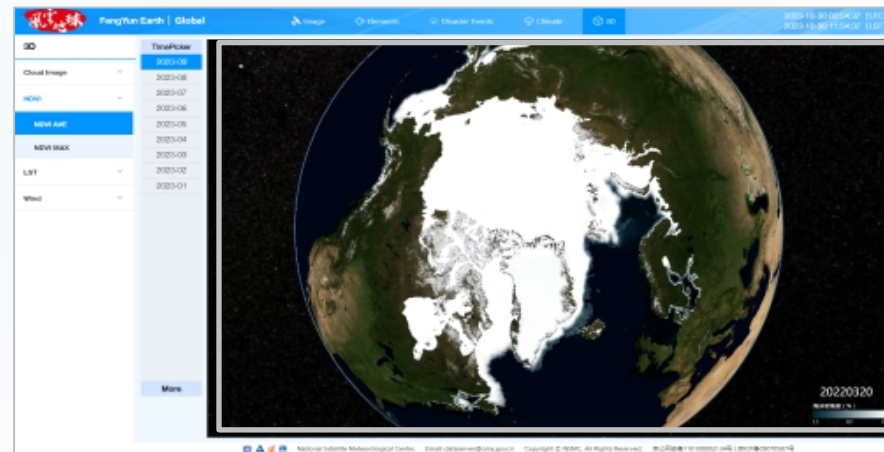


## REFINED

The platform offers over 100 quantitative products across five categories, including satellite images, meteorological elements, disaster events, climate, and model verification.

## SMART

The platform employs artificial intelligence technology to automate the analysis, extraction, and modeling of extensive data sets, enabling the intelligent identification of extreme weather and climate events.



## CUSTOMIZABLE

The platform boasts robust customization features in line with the specific needs of different countries and regions, catering to the personalized requirements of users.



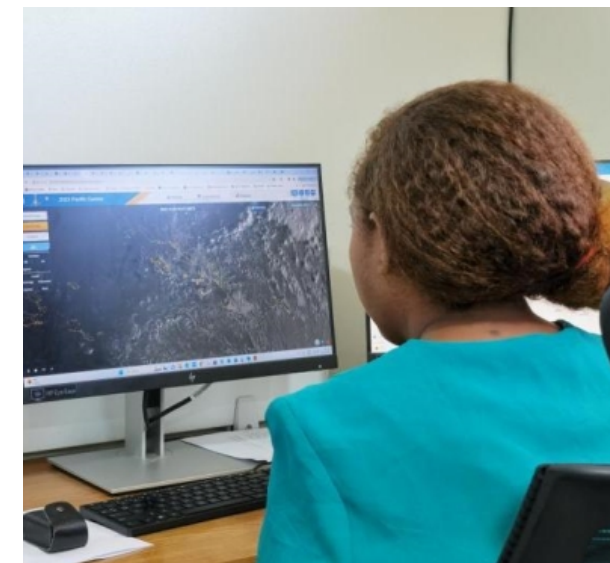
# Coordination Group for Meteorological Satellites - CGMS



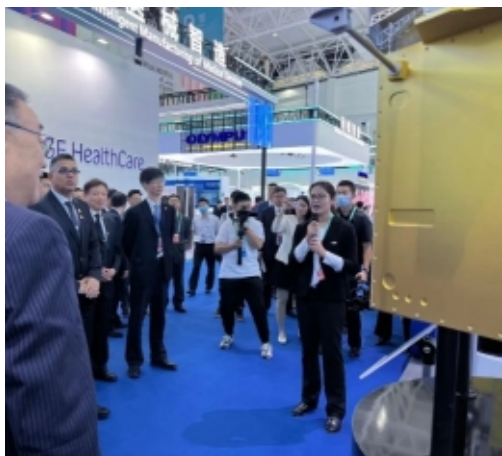
CMA-EUMETSAT Bilateral meeting in Mar. 2024



WMO SG visited CMA in Mar. 2024



FengYun Earth support the Pacific Games



China-Arab Expo 2023  
**Coordination Group for Meteorological Satellites**



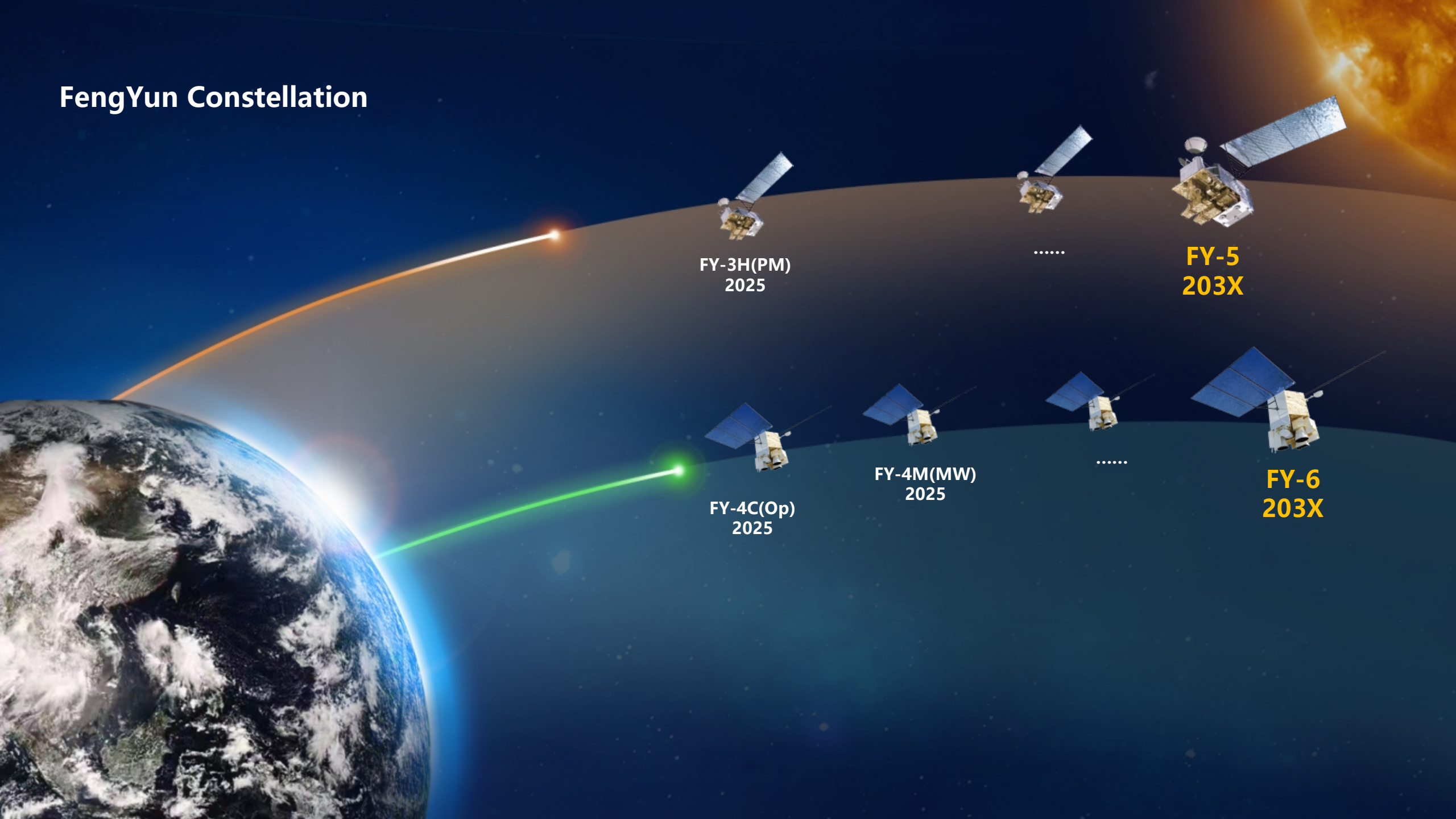
Forum on Early Warning for All hosted by CMA



FY 2023 conference



# FengYun Constellation



FY-3H(PM)  
2025

.....

**FY-5**  
**203X**

FY-4C(Op)  
2025

FY-4M(MW)  
2025

.....

**FY-6**  
**203X**



## FY-3H: support to G3W

### Greenhouse gas column concentration

- ✓ GAS-II on FY3H will launch in 2026(For XCO<sub>2</sub>,XCH<sub>4</sub>,XN<sub>2</sub>O)
- ✓ New generation polar orbit satellite also will onboard new GAS

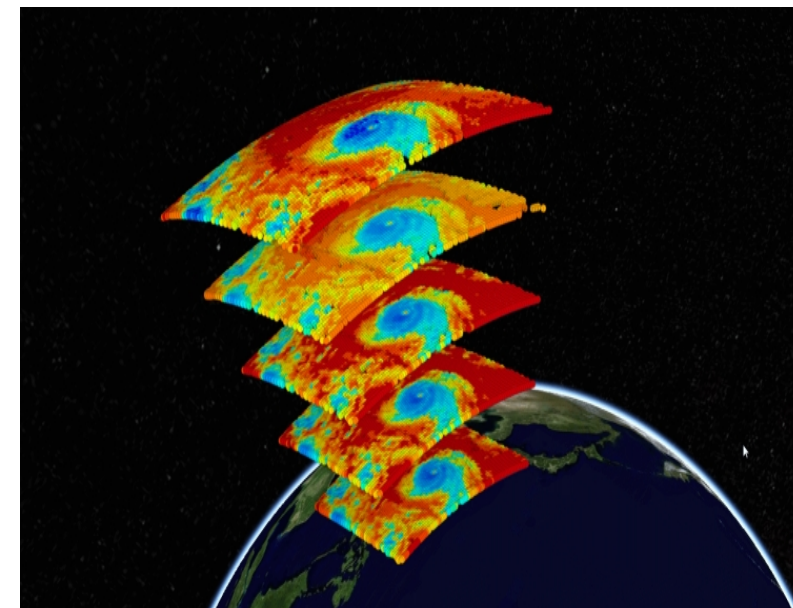
### Greenhouse gas profile concentratio

- ✓ HIRAS-II on FY3H will launch in 2026(For CO<sub>2</sub>,CH<sub>4</sub> profile)
- ✓ New generation polar orbit satellite also will onboard new HIRAS

## FY-4C: AGRI+GIIRS+LMI+SEP

- AGRI:19 Chanel, 250m+ spatial resolution, Full-disk=5min
- GIIRS

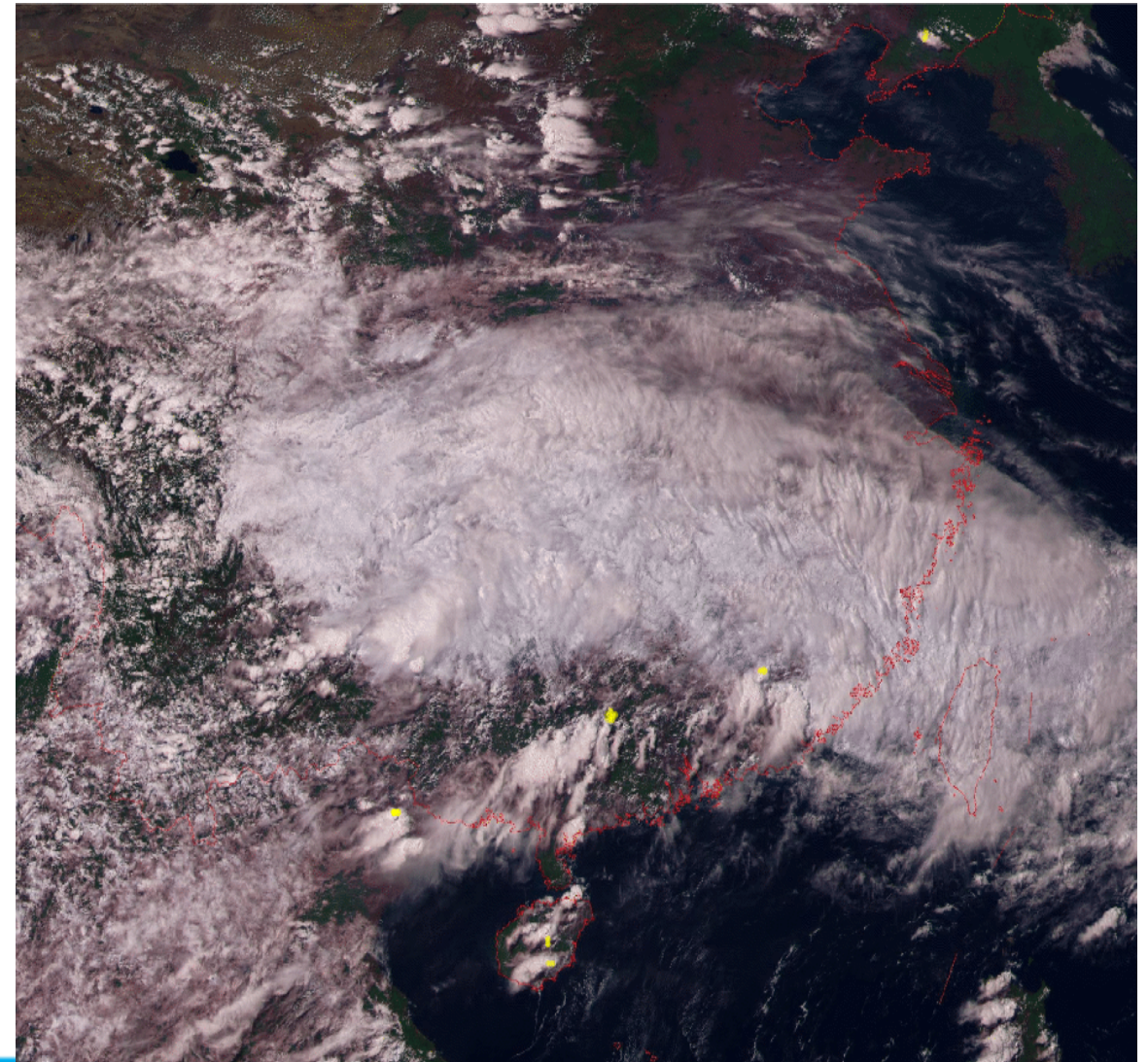
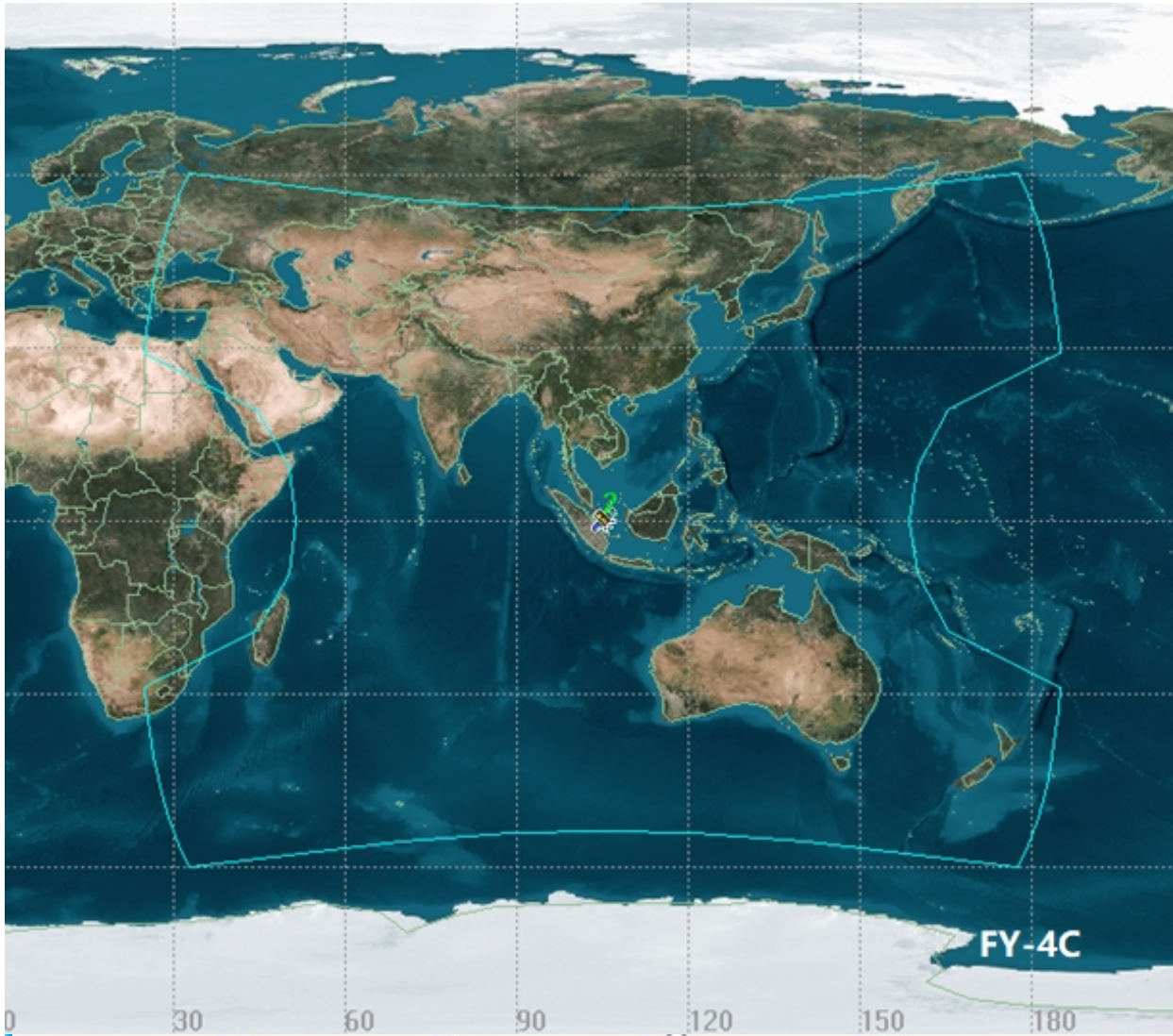
	FY-4A GIIRS	FY-4B GIIRS	FY-4C GIIRS
Spectral range (cm <sup>-1</sup> )	700 – 1130	680 – 1130	650 – 1130
	1650 – 2250	1650 – 2250	1650 – 2250
Spectral resolution (cm <sup>-1</sup> )	0.625	0.625	0.625
	0.625	0.625	0.625
Sensitivity@280K (K)	0.4-0.8	0.4	0.2
	0.8-1.2	0.8	0.1
Spatial resolution (Km)	16	12-16	8
Temporal resolution (min)	60Min (5000X5000Km)	45 Min (5000X5000Km)	45 Min (5000X5000Km)
Planned Launch	2016	2020	TBD
Status	R&D	Op.	Op.





## FY-4C: AGRI+GIIRS+LMI+SEP

- LMI





- CMA will support CGMS activities in the future, including as a potential host of the CGMS-53 working group meeting at the end of April, 2025
- CMA will held the 2025 FengYun Satellite International User Conference, all stakeholders of CGMS are welcome.

# THANKS

**Coordination Group for  
Meteorological Satellites**

