Brief Introduction To FengYun Meteorological Satellites

YANG Jun

On behalf of National Satellite Meteorological Center,CMA

GSICS Annual Meeting
Changchun, **2025.03**

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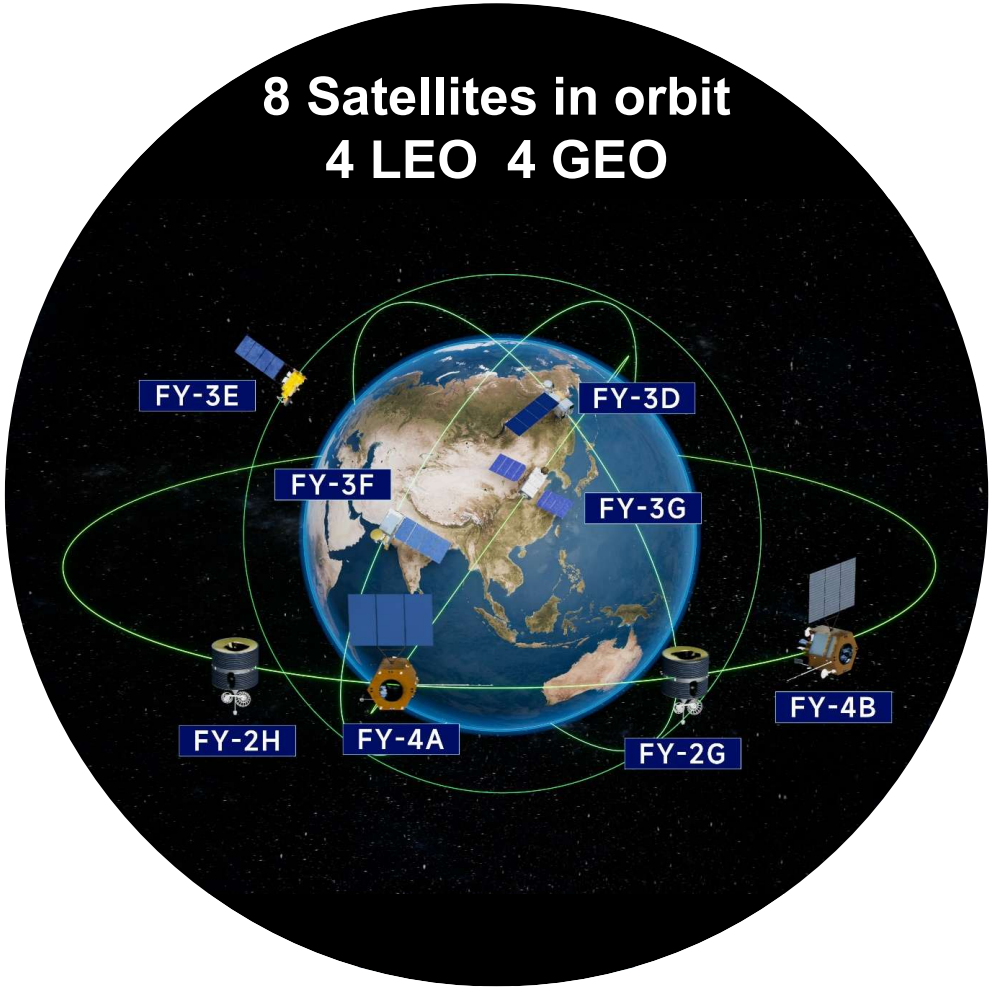
Current FengYun Constellation in orbit

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 (123.5°E) , Full disk every 15 min.

FY-4B
FY-4B (105°E), Full disk every 15 min, partial areas rapid scanning at 1 min.
Operational since 1st December 2022



LEO

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

NSMC NCSW 国家卫

2 New Members of FengYun LEO Family

FY-3F

a new morning orbit satellite

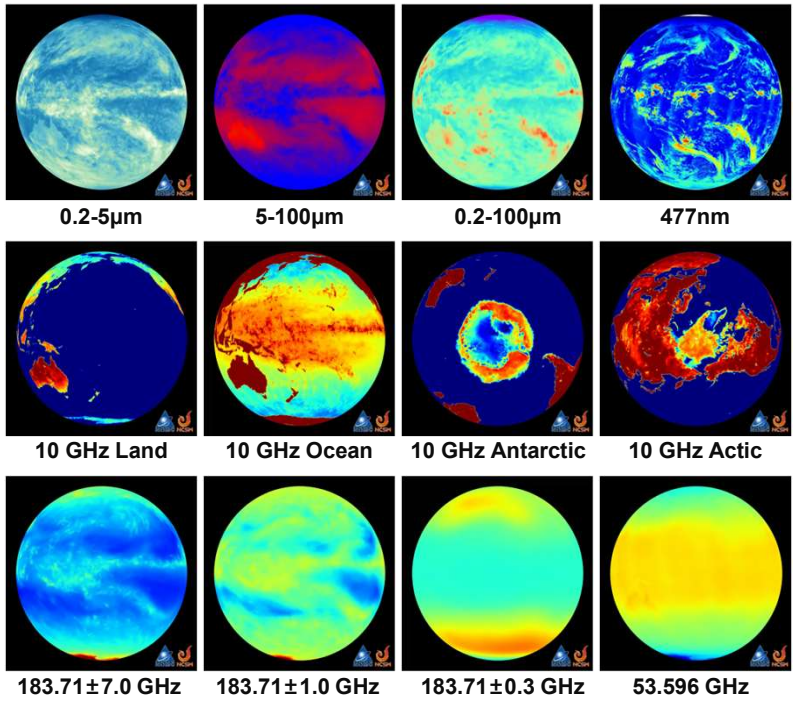
Successfully launched on 3rd Aug. 2023

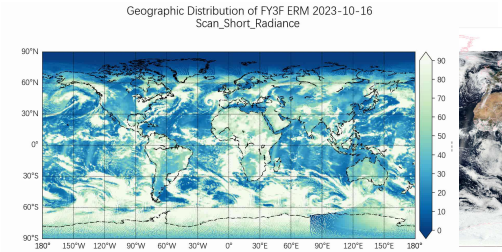
10 instruments, including two new Ozone Monitoring Instruments integrated nadir and limb observation

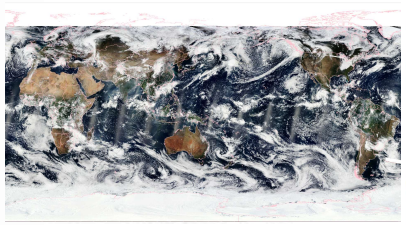
Inherit and continue the morning orbit FY-3 observation service

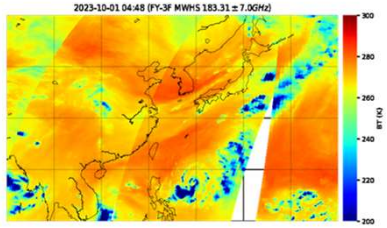
Continue to provide 3D global atmospheric detection data for numerical weather prediction models with more than 50 products

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









2 New Members of FengYun LEO Family

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

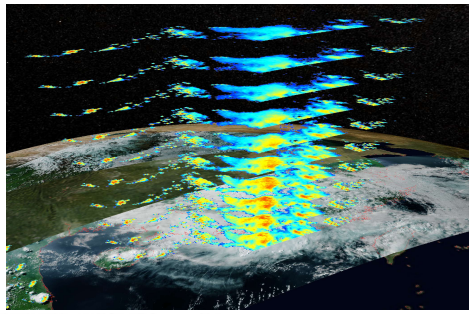
First image released on 15 May 2023

Onboard testing data are available to global users.

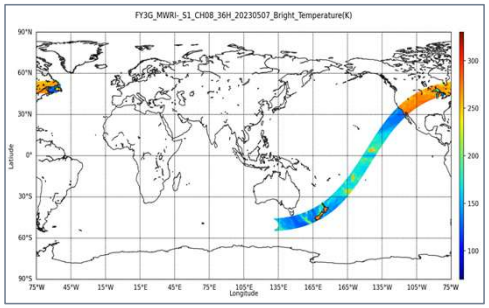
http://data.nsmc.org.cn

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 ★

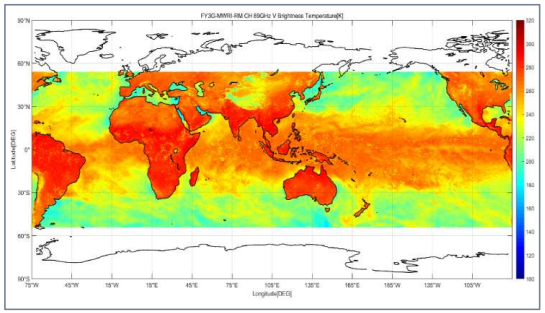
FY-3G



PMR and MERSI-RM first image



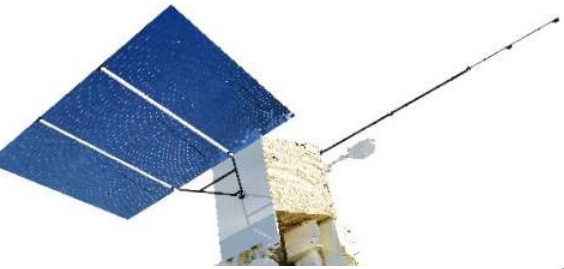
MWRI-RM first image



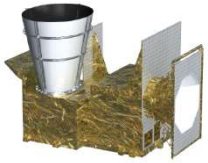
MWRI-RM first global image

FengYun GEO Family : FY-4A & FY-4B

- FY-4A, launched on Dec. 11, 2016, operated at 105° E, and now relocated at 123.5° E, non operational 。
- 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， operated **105° E now.**

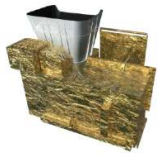


Geostationary High-speed Imager (GHI)

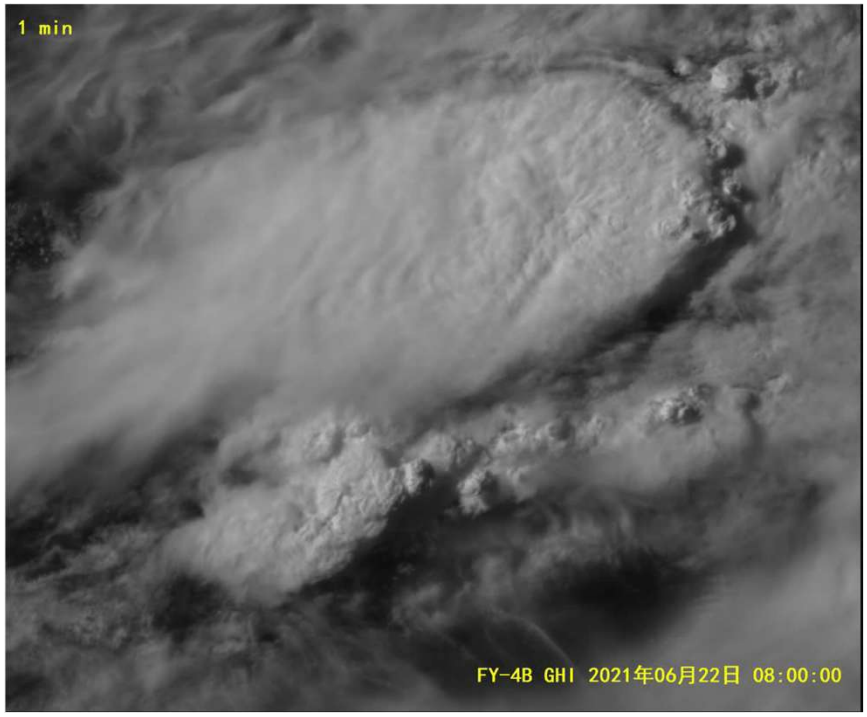


Geostationary Interferometric Infrared Sounder (GIIRS)

Space Environment Monitoring Instrument Package (SEP)



Advanced Geostationary Radiation Imager (AGRI)



FY-4B Geo. High-speed Imager (GHI)

GSICS activities hosted by CMA

- **2012 Annual Meeting**
  - 05 Mar - 09March 2012
  - Beijing, China

- **2017 Second Joint GSICS-IVOS Lunar Calibration Workshop**
  - 13 Nov – 16 Nov 2017
  - Xi'an, China.

- **2018 Annual Meeting**
  - 19 Mar – 23 Mar 2018
  - Shanghai, China.

- **2025 Annual Meeting**
  - 17 Mar – 21 Mar 2025
  - Changchun, China.

Follow-up Launch Plans

- Plans in 2025 :
  - FY-3H, the 8th LEO satellite in FY-3 series, will be operated in AM orbit. Launch scheduled in Q3 this year.
  - FY-4C, the 3rd GEO satellite in FY-4 series with significant improvement, and will be positione at 133°E, launch scheduled in Q4 this year.

- Plans in 2026:
  - FY-3I, the 2nd Rainfall satellite as the succesor of FY-3G.
  - FY-4D, the GEO satellite to take replace of FY-4B

FengYun Instruments relevant to GSICS

Current instruments status in orbit

Satellite		Launch	EO instruments					
FY-3D	(Op)	2017-11-15	MERSI	HIRAS	MWTS	MWHS	MWRI	IPM
			GAS	WAI	SEM	GNOS		
FY-3E	(Op)	2021-07-05	MERSI-LL	HIRAS-II	SIM-II	SSIM	MWTS-III	MWHS-II
			WindRAD	GNOS-II	Tri-IPM	SEM-II	X-EUVI	
FY-3G	(Op)	2023-04-16	MERSI-RM	MWRI-RM	PMR	GNOS-II		
FY-3F	(Op)	2023.08.03	MERSI-III	HIRAS-II	SIM-II	ERM-II	MWTS-III	MWHS-II
			MWRI-II	GNOS-II	OMS-N	OMS-L		

Satellite (status)		Location	Launch	EO instruments			
FY-2G	(Op)	99.2° E	2014-12-31	S-VISSR			
FY-2H	(Op)	79° E	2018-06-05	S-VISSR			
FY-4A	(B)	123.5° E	2016-12-11	AGRI	GIIRS	LMI	SEP
FY-4B	(Op)	105° E	2021-06-03	AGRI	GIIRS	GHI	

Satellite Status
Op = Operational
Pre = Pre-operational
B = Back-up, secondary
L = Limited availability

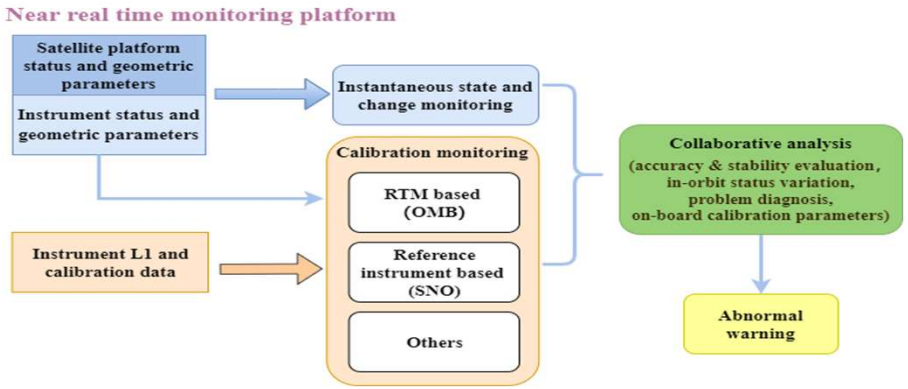
Instrument Status	
	Operational(or capable of)
	Operational with limitations(or Standby)
	Operational with Degraded Performance
	Not Operational
	Functional, Turned Off

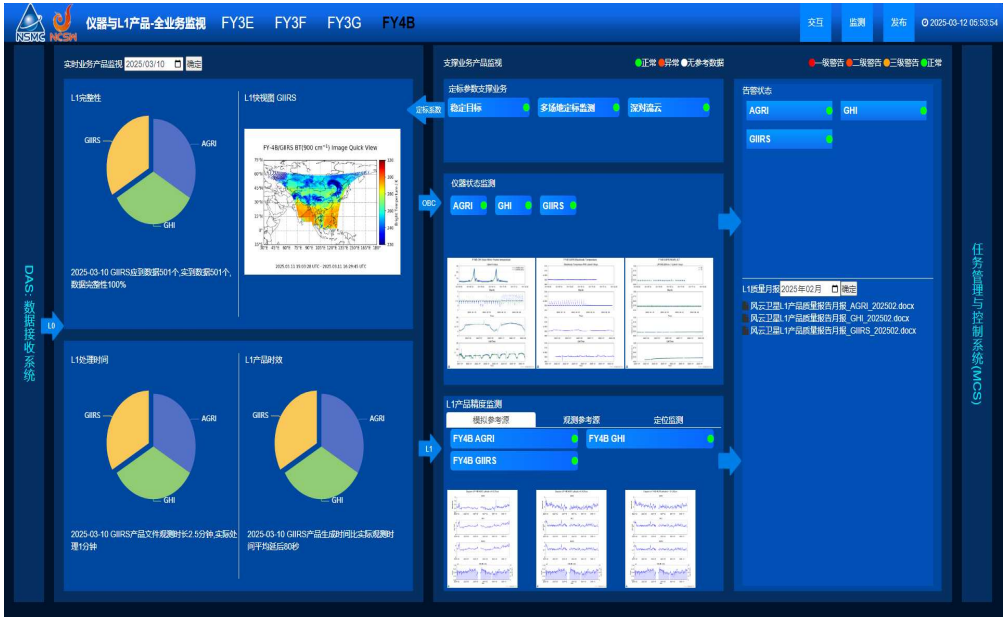
http://www.nsmc.org.cn/nsmc/en/operation/status.html

L1 data quality monitoring system

Operational L1 data quality monitoring/alarming:

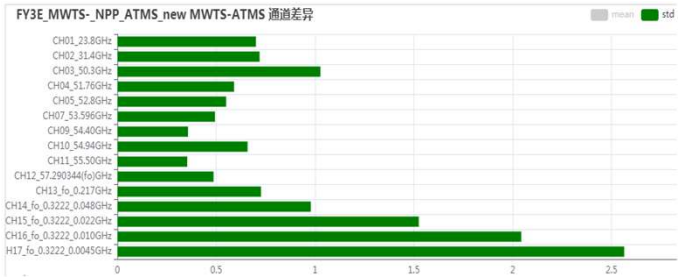
- **Instrument healty status parameter monitoring**
- **L1 calibration accuracy monitoring: based on RTM simulation and reference instruments**
- **Other calibration analysis**

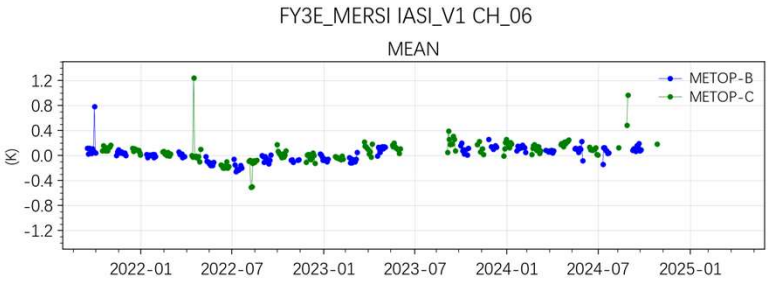


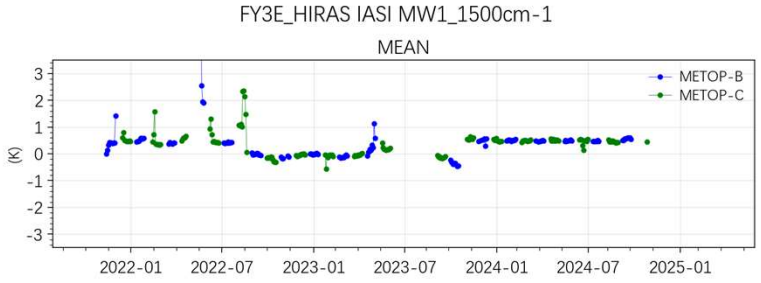


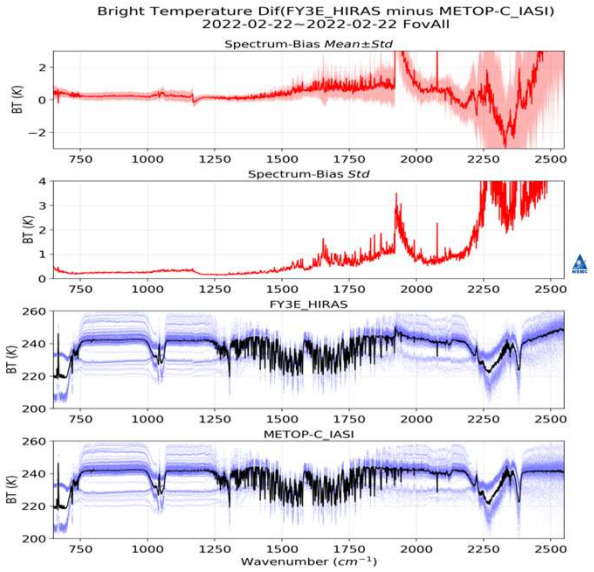
L1 quality monitoring using reference instrument

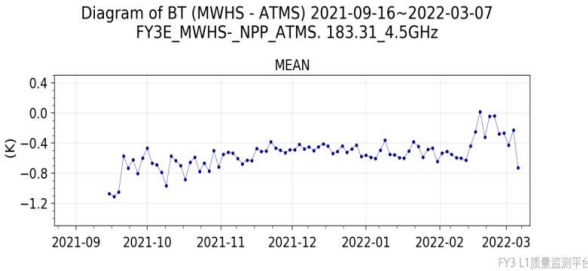
- **MERSI & AGRI: vs. IASI /Metop**
- **HIRAS & GIIRS: vs. IASI /Metop**
- **MWTS & MWHS: vs. ATMS of NPP/JPSS**
- **WindRAD: vs. CFOSAT&HY-2/SCAT, Metop/ASCAT**

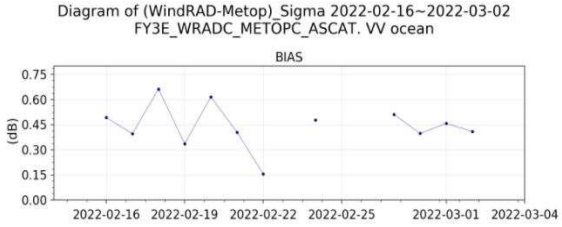






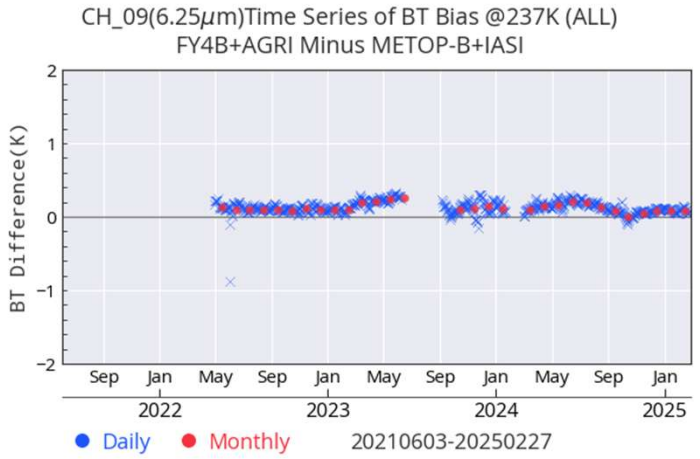


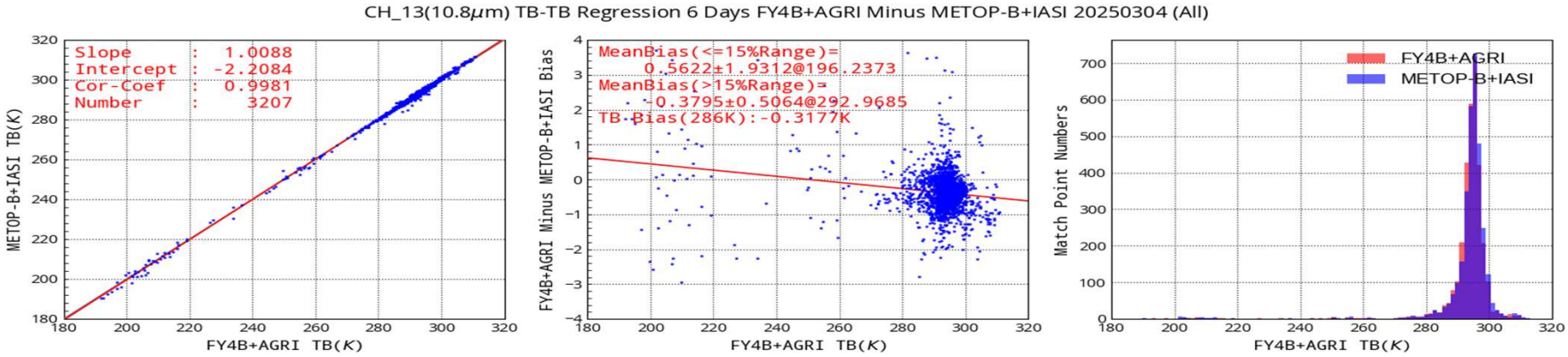




L1 quality monitoring using reference instrument

- **AGRI and IASI inter-comparison**
  - ➢ Developed GEO-LEO inter-calibration system under GSICS unified framework.
  - ➢ Produce GSICS demo correction product.
- **Diagnose abnormal spatial distribution of bias for 8.55μm.**
  - ➢ For FY-4A,anomaly spatial distribution with seasons.
  - ➢ For FY-4B,anomaly spatial distribution in Australia with seasons.
- **Bias analysis of hot land**
  - ➢ Collocations' time difference are not symmetrically distributed over hot land for channels of 8.55,10.8 and 12μm.





L1 quality monitoring using NWP+RTM

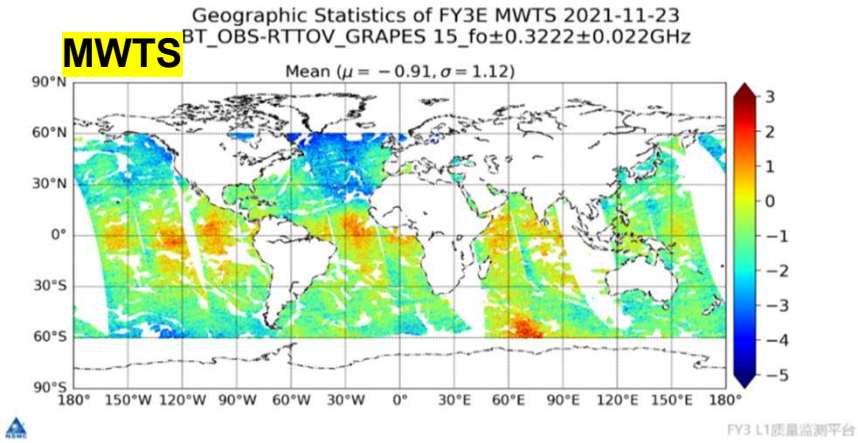
Instruments include:

- **Infrared:** MERSI, AGRI,HIRAS,GIIRS
- **Passive MW:** MWTS, MWHS
- **Active MW:** WindRAD

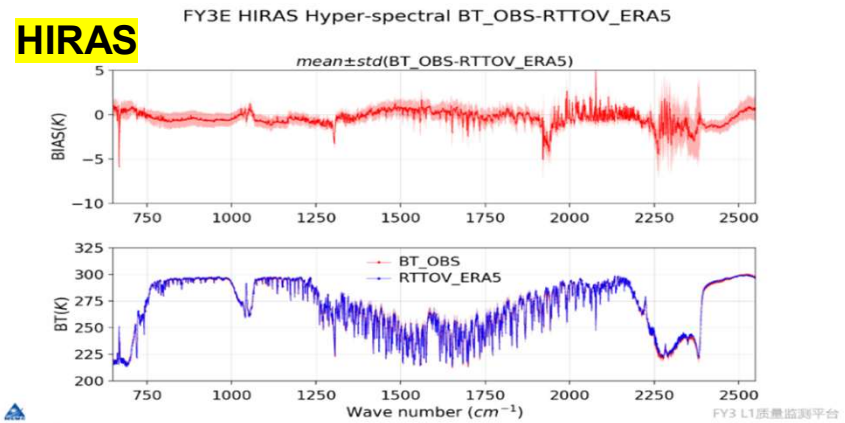
NWP+RTM

- **NWP data:** CMA-GFS, ERA-5, CRA
- **RTM Model**: RTTOV, CRTM, ARMS, LBLRTM, GMF,…

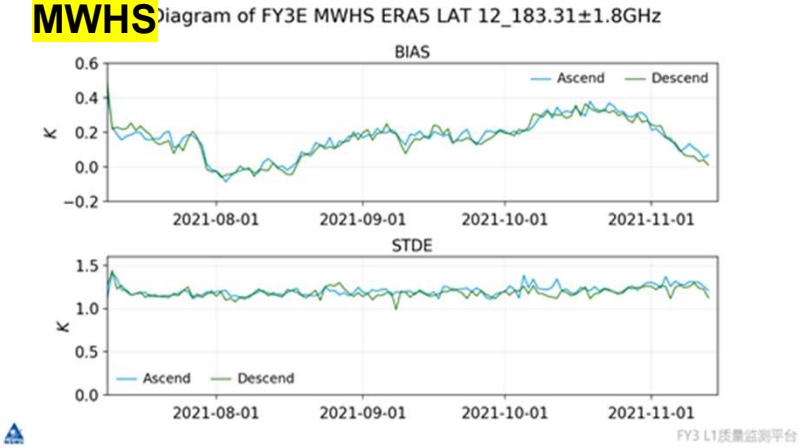
MWTS



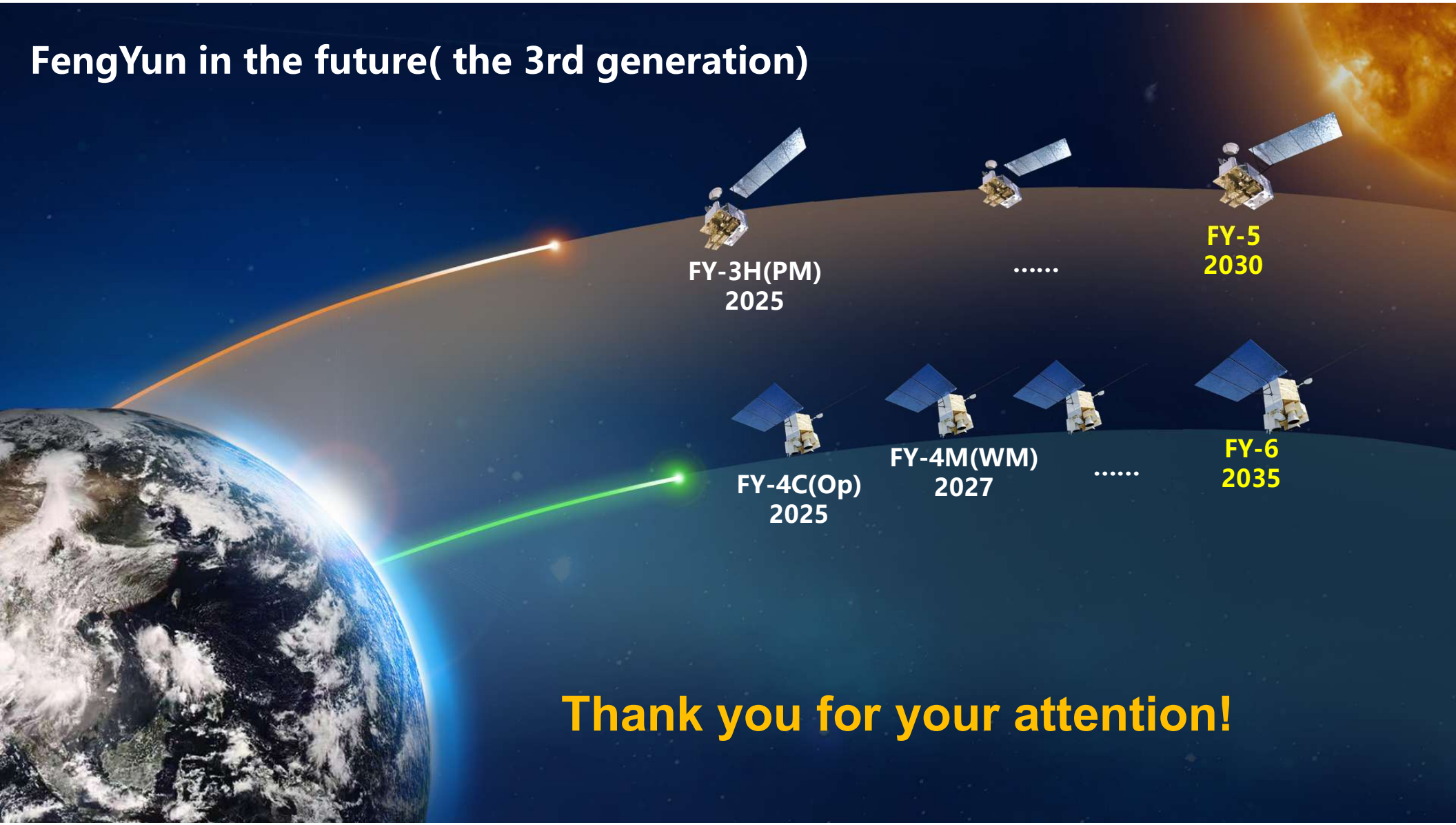
HIRAS



MWHS



FengYun in the future(the 3rd generation)



Thank you for your attention!