CMA updates since CGMS-50 and report on the medium to long-term future plans

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China Meteorological Administration

Presented to CGMS-51 plenary session

26 June 2023

Outline

- **Highlights since CGMS-50**
- Medium to long-term future plans

Constellation: 8 Satellites in orbit

- 4 LEO (FY-3C,FY-3D,FY-3E,FY-3G)
- 4 GEO (79E, 99.5E,105E,133E)

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.

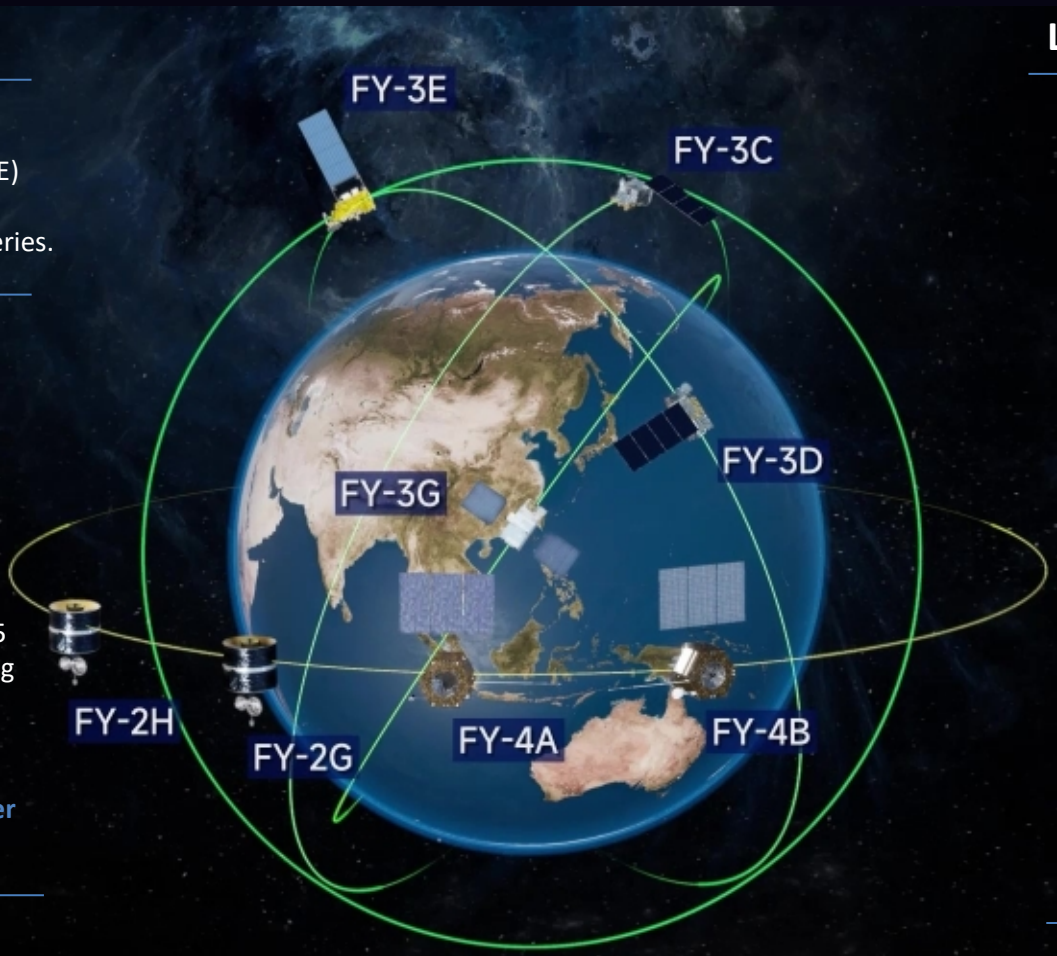
FY-4A

China's second generation GEO meteorological satellites.

FY-4A (104.7°E) , Full disk every 15 min.

FY-4B

FY-4B (133°E), Full disk every 15 min, partial areas rapid scanning at 1 min.
Pre-operational since 1st June 2022
Operational since 1st December 2022



LEO

FY-3C

Mid-morning orbit
Operational with degraded performance

FY-3D

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

FY-3E

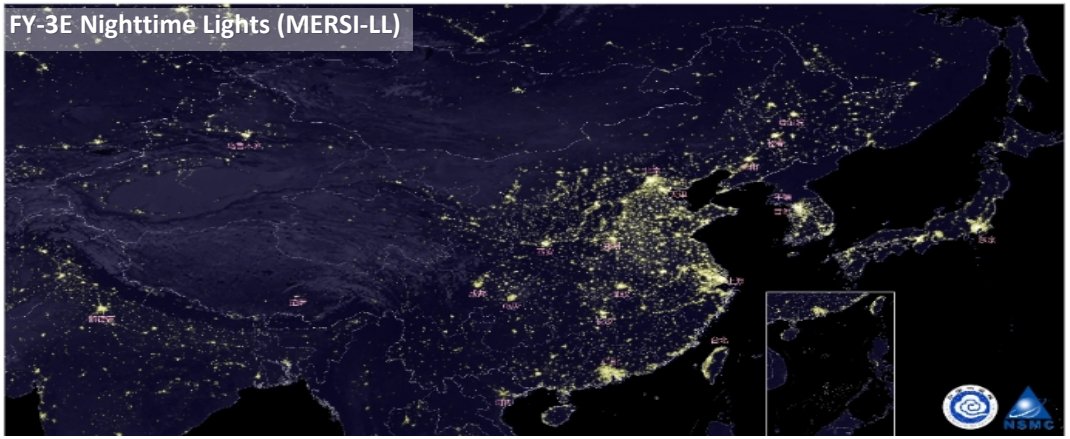
Early-morning orbit, ECT 5:41 LT
11 EO instruments
Pre-operational since 1st June 2022
Operational since 1st December 2022

FY-3G

Drifting orbit
6 EO instruments
Simulation data released

Status of FY-3E and FY-4B

- FY-3E: 46 baseline products(L2) have been developed.
- FY-4B: 52 baseline products(L2) have been developed.
- FY-3E and FY-4B become officially operational since 1st Dec. 2022.



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FY-3E and FY-4B become officially operational

Source: China Meteorological News Press 05-12-2022

On December 1, after 6-month trial operation in observing typhoon, rainstorm, and severe convection during this year's flood season, FENGYUN-3E meteorological satellite and FENGYUN-4B meteorological satellite and their ground application systems become officially operational.

As members of World Meteorological Organization (WMO) Integrated Global Observing System, FY-3E and FY-4B have effectively supported "Belt and Road" construction and disaster preparedness.

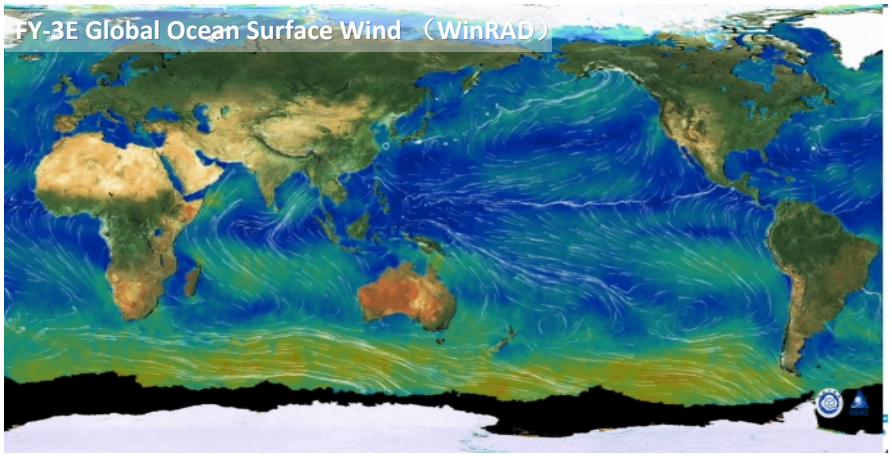
On September 29, 2021, FY-3E released the first batch of products of high definition global ocean surface wind field distribution of different time intervals, atmospheric temperature and humidity distribution of different heights. Source: National Satellite Meteorological Centre of CMA

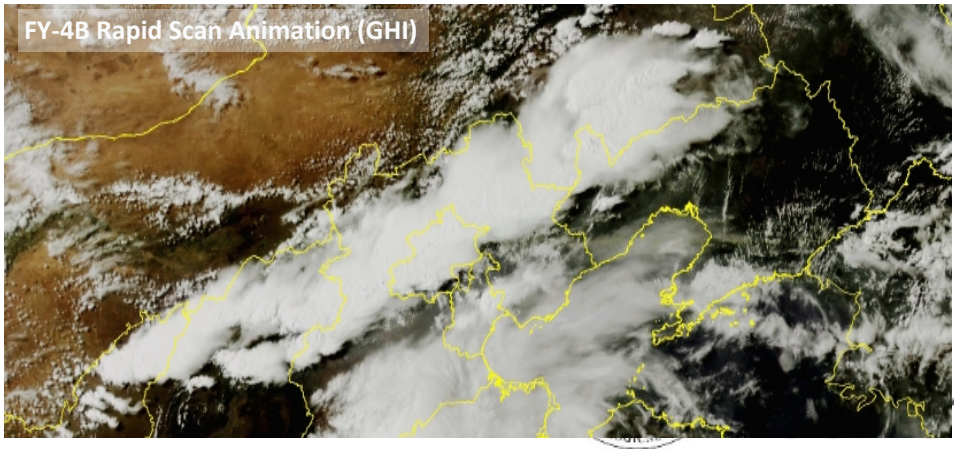
Researches were carried out on numerical weather prediction (NWP) assimilation by harnessing instruments onboard FY-3E during the periods of typhoon Muifa and typhoon Ma-on. The data assimilation of FY-3E has elevated the forecasting evaluation of quantitative precipitation, which has boosted the rainfall forecasting capacity of NWP system.

FY-4B has activated 22 intensive observations during its trial operation. It has played an instrumental role in weather forecast of precipitation in North China, severe convection in Qinghai, cold vortex in Northeast China, and typhoon emergency response.

During trial operation, FY-3E has pushed 650GB data to National Meteorological Information Centre via data distribution, providing data services to users at home and abroad. FY-4B has provided 90 kinds of product sharing services and released 37 kinds of products.

So far, China Meteorological Administration (CMA) has successfully launched 19 FY meteorological satellites, of which 7 remain in orbit, providing data and services to 124 countries and territories around the world. (Dec.5)



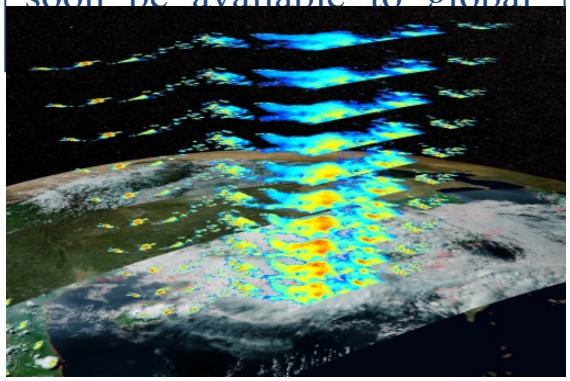


Status of FY-3G

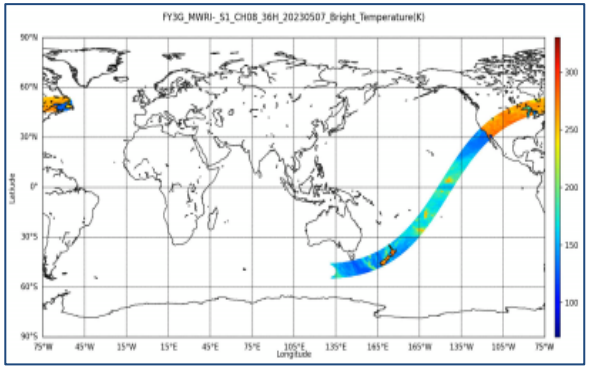
Welcome to participate FY-3G Application Pioneer Project.

- FY-3G,The first precipitation measurement satellite in China, was successfully launched at 9:36 16th 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 will soon be available to global

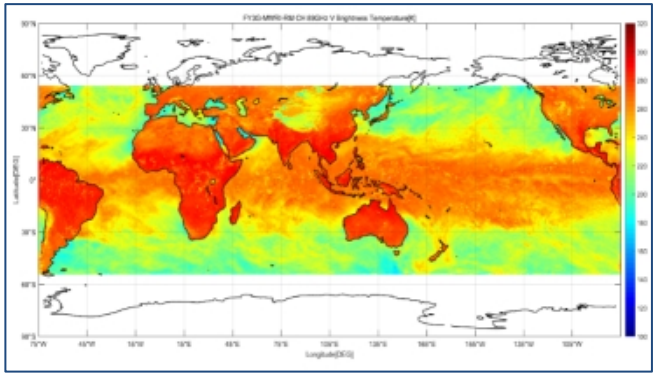
Instrument Name	Acronym
Precipitation Measurement Radar	PMR ★
GNSS Radio Occultation Sounder - 2	GNOS-2
MERSI-Rainfall Measurement	MERSI-RM
Micro-Wave Radiation Imager for the Rainfall Mission	MWRI-RM
High Accuracy On-board Calibrator	HAOC ★
Short-wave Infrared Polarized Multi-Angle Imager	PMAI ★



PMR+MERSI-RM first image



MWRI-RM first image

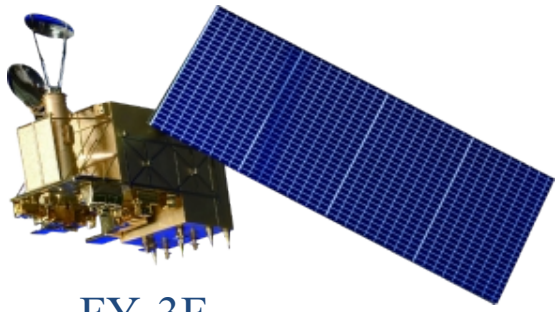


MWRI-RM first global image

Coordination Group for Meteorological Satellites

CGMS

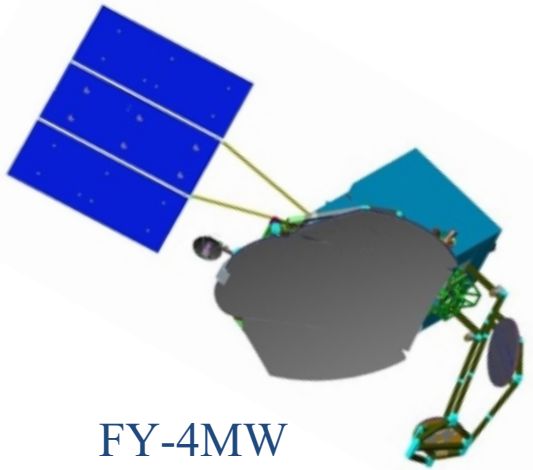
Status of FY-3F and FY-4MW



FY-3F

- Orbit：AM
- Launch time：Aug. 2023

Acronym	Full name
MWHS-2	Micro-Wave Humidity Sounder -2
SWS/IPM	Space Weather Suite / Ionospheric PhotoMeter
SWS/WAI	Space Weather Suite / Wide-field Auroral Imager
MWTS-3	Micro-Wave Temperature Sounder - 3
HIRAS-2	Hyperspectral Infrared Atmospheric Sounder - 2
SWS/SEM/FGM	Space Weather Suite / Space Environment Monitor / Flux Gate Magnetometer
GNOS-2	GNSS Radio Occultation Sounder - 2
OMS-nadir	Ozone Monitoring Suite - nadir scanning unit
OMS-limb	Ozone Monitoring Suite - limb scanning unit
MERSI-3	Medium Resolution Spectral Imager - 3
MWRI-2	Micro-Wave Radiation Imager 2
ERM-2	Earth Radiation Measurement - 2



FY-4MW

- Orbit：GEO
- Launch time： TBD
- Mission target : high-frequency, three-dimensional humidity and temperature.

Operation： FengYun Brain

a Smart Command and Decision Platform

Observation → Satellites Management → Ground Segments Operation →

Research & Development → Application → Service

GSICS updates

http://www.nsmc.org.cn/nsmc/en/news/index.html

Satellite		Launch	EO instruments					
FY-3C	(L)	2013-09-23	MERSI	VIRR	IRAS	MWTS	MWHS	MWRI
			SBUS	TOU	ERM	SIM-II	SEM	GNOS
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	

Satellite (status)		Location	Launch	EO instruments			
FY-2G	(Op)	99.2° E	2014-12-31	S-VISSR			
FY-2H	(L)	79° E	2018-06-05	S-VISSR			
FY-4A	(Op)	104.7° E	2016-12-11	AGRI	GIIRS	LMI	SEP
FY-4B	(Op)	133° E	2021-06-03	AGRI	GIIRS	GHI	

- 4 updates for FY-3D instruments：MWRI geolocation updated on Apr, 2022；MWRI preprocessing system added thermal mirror temperature correction module on Jun, 2022；MWTS-II updated the calibration algorithm to improve the bias difference between ascending and descending orbit on Aug, 2022；MERSI calibration coefficients updates for visible channels, Mar, 2023.
- 3 updates for FY-3E instruments：MWTS-III calibration program corrected the influence of out-of-band signals in channel 7 and 8 on Dec, 2022；MERSI-LL infrared channel multiple detectors signal normalization updated on Mar, 2023；HIRAS-II instrument operating temperature changed, coefficient updated on Sep, 2022.
- 1 update for FY-4B instruments：GIIRS L0~L1 data processing algorithm updated on June, 2022, and the L1 products were operationally distributed.

Satellite Status

Op = Operational

P = Pre-operational

B = Back-up, secondary

L = Limited availability

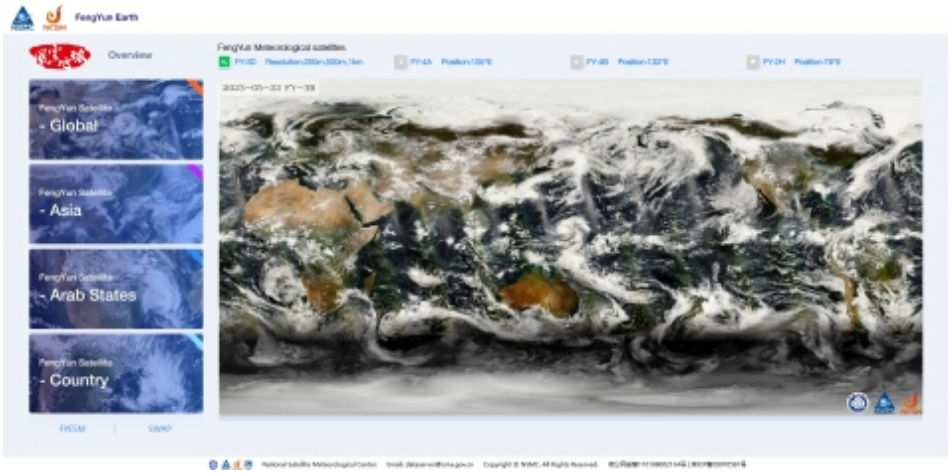
Instrument Status

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

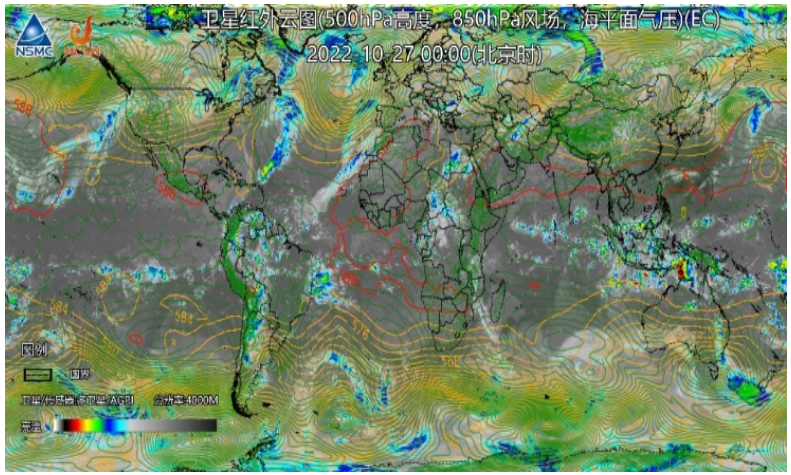
Services： FengYun Earth

a light-weighted platform

- Forecaster oriented： Images, Elements， Weather Situation， Verification
- Service embedded： Integrated satellite， ground， radiosonde， radar， etc.
- Cloud based： private cloud, public cloud, and Hybrid cloud
- User tailored： Customized products based on user's requirements and user's local observation



Global Weather Situation Map



Accessible, Convenient, Efficient, Addictive

Coordination Group for Meteorological Satellites

CGMS

Services： FengYun Space

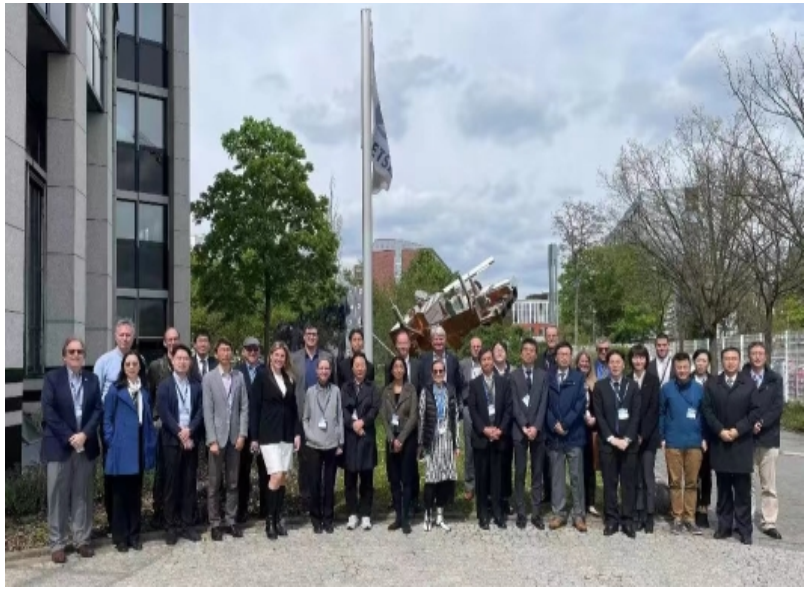
the 3rd generation space weather operation system

A fully functional system of space weather monitoring, forecasting, and services based on ultra-high resolution 3D computing engines, digital Earth, and data fusion technology

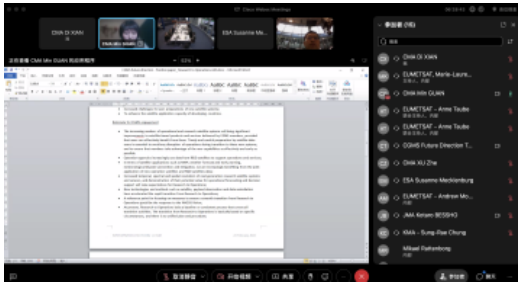
CMA engagement in CGMS activity

- Working group meetings
- Task team meetings

Dr. CHEN Zhen-Lin, the CMA administrator visited EUMETSAT and CGMS secretariat at 30th May,2023

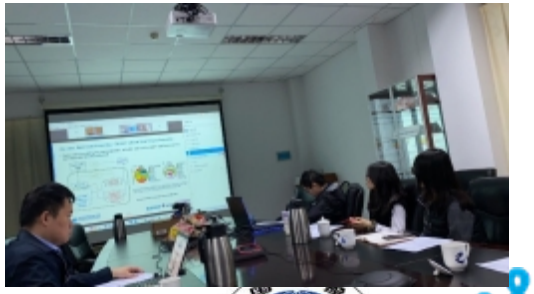


CMA delegation participated CGMS-51 working group meeting at Apr. 2023



WGIII

Cloud computing task team



WGIV

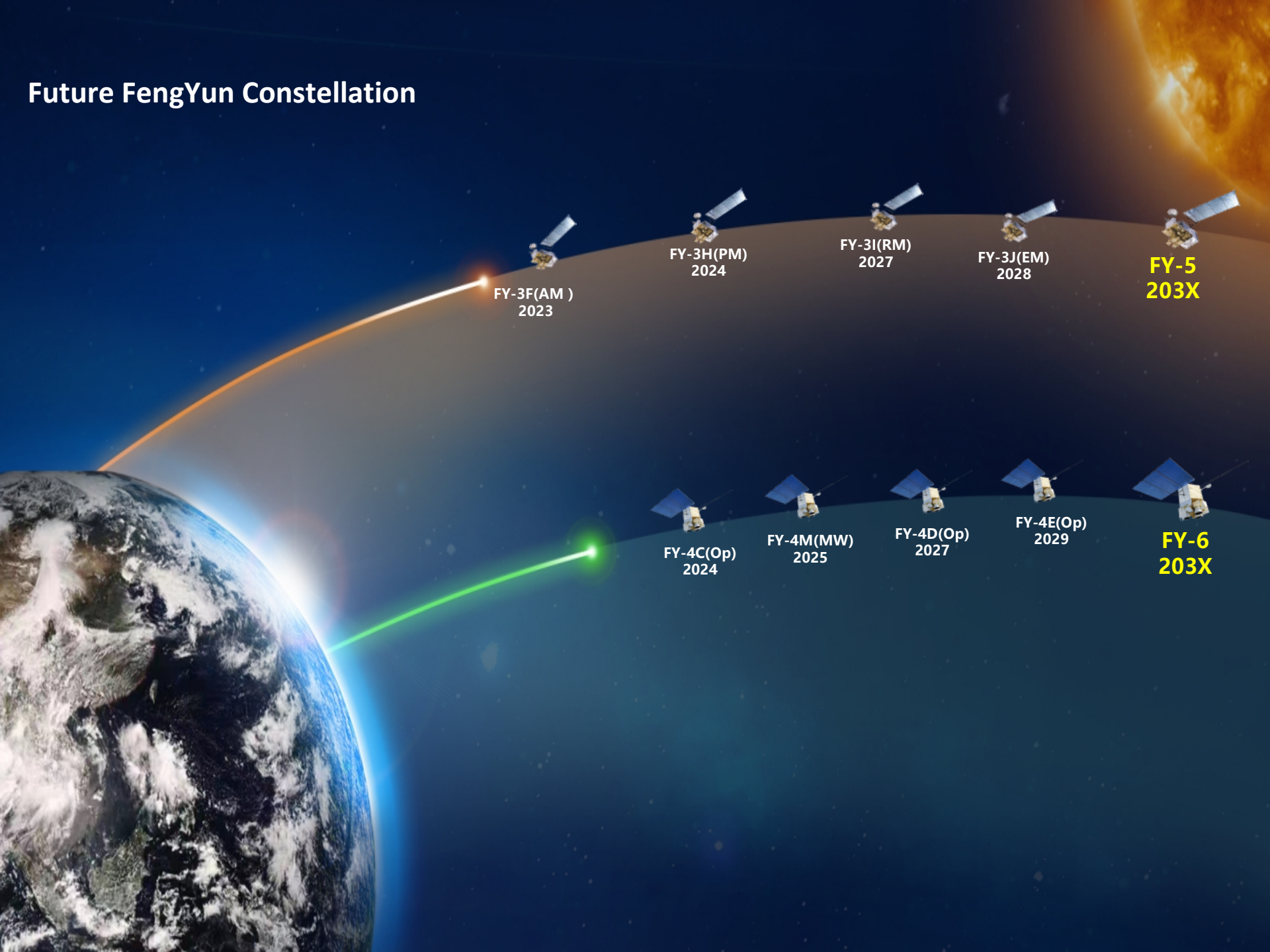
Coordination Group for Meteorological Satellites

CGMS

Outline

- Highlights since CGMS-50
- **Medium to long-term future plans**

Future FengYun Constellation



Comments & Suggestions

- **Coordinate long-term plan**: to urge governments to act.
- **Embrace new technology:** to speed up application of AI/ML and other new technologies from research to operation (R2O), especially on infrastructure construction.
- **Enhance space weather activities:** to meet increasing requirements from space weather services.
- **Enhance user engagement:** to propose joint plan(s) by all members to support the developing countries for disaster prevention and mitigation.

Thanks for your attention