

China's FengYun Meteorological Satellite Programs



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Chinese Meteorological Satellite: FengYun Series

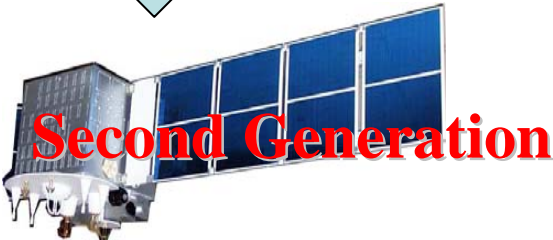
Polar System

Geostationary System

FY
|
1A
1B
1C
1D



FY
|
3A
3B
3C
...
3F



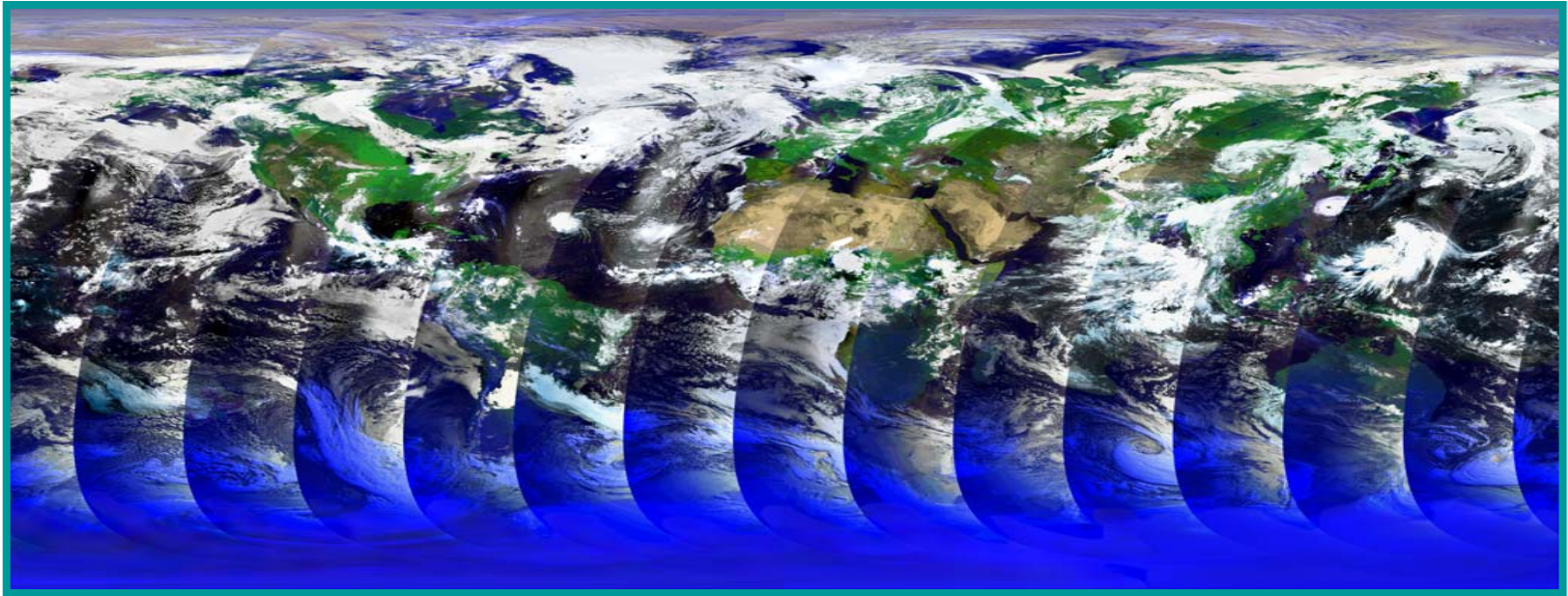
FY
|
2A
2B
2C
2D
2E



FY
|
4A
4B
4C
...
4F



FengYun LEO. Satellites: FY-1



Instruments:

- ✓ 10 chl. Visible and Infrared radiometer.
- ✓ Space Environment Monitor

Transmission:

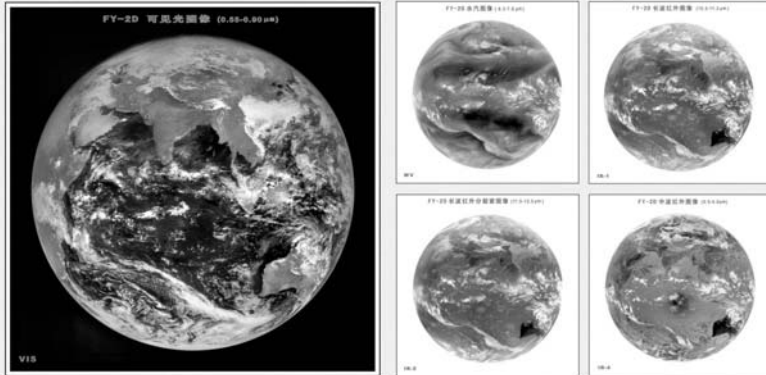
- ✓ HRPT: 1.3308Mbps (DB)
- ✓ GDPT: 1.3308Mbps

No.	Status	Launch	Druation
FY-1A	Exp. (dead)	Sept.7, 1988	6 months
FY-1B	Exp. (dead)	Sept.3, 1900	8 months
FY-1C	Op. (dead)	May 10, 1999	>7 years
FY-1D	Op. (working)	May 15, 2002	>7 years

FengYun GEO. Satellites: FY-2

风云二号 D 星第一套图像
THE FIRST IMAGES OF FY-2D SATELLITE

2007年1月12日 14:00 (北京时间)
January 12, 2007 06:00(UTC)



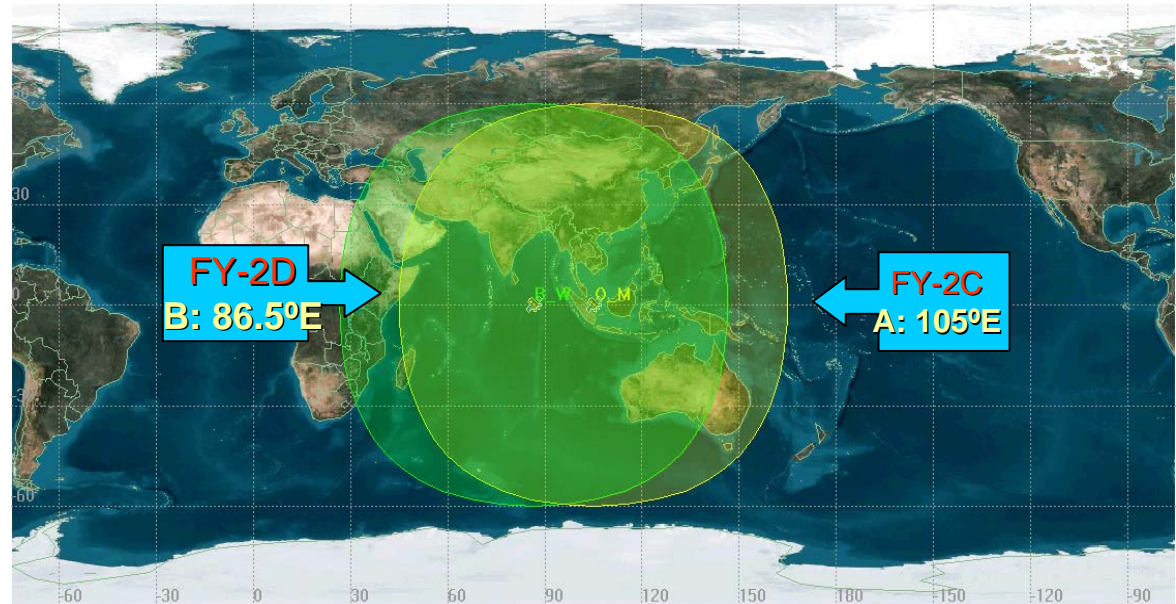
No.	Pos.	Status	Launch
FY-2A	105E	Exp. (dead)	Jun.10, 1997
FY-2B	105E	Exp. (dead)	Jun.20, 2000
FY-2C	105E	Op. (working)	Oct.18, 2004
FY-2D	86.5E	Op. (working)	Dec.8, 2006
FY-2E	105E	Op. (Stored)	Dec.23,2008

Platform: Spin stabilization

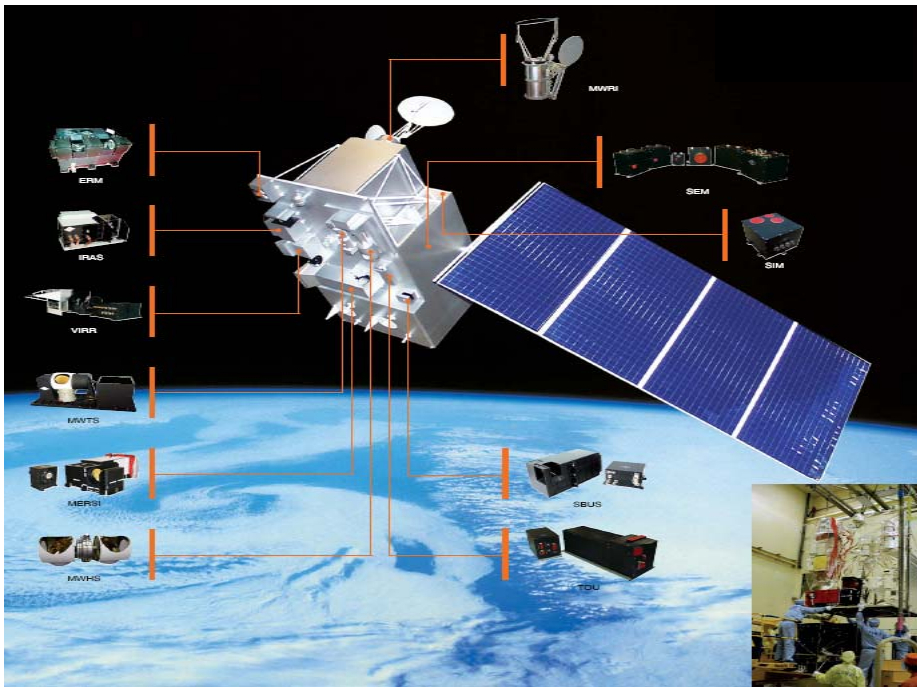
Payload: 5 chl. VISSR

Full Disc: every 30 min. at most

- ✓ FY-2C & FY-2D are working together to implement 15 min. interval obs.
- ✓ FY-2E is stored at 123.5E, will take over FY-2C this month!

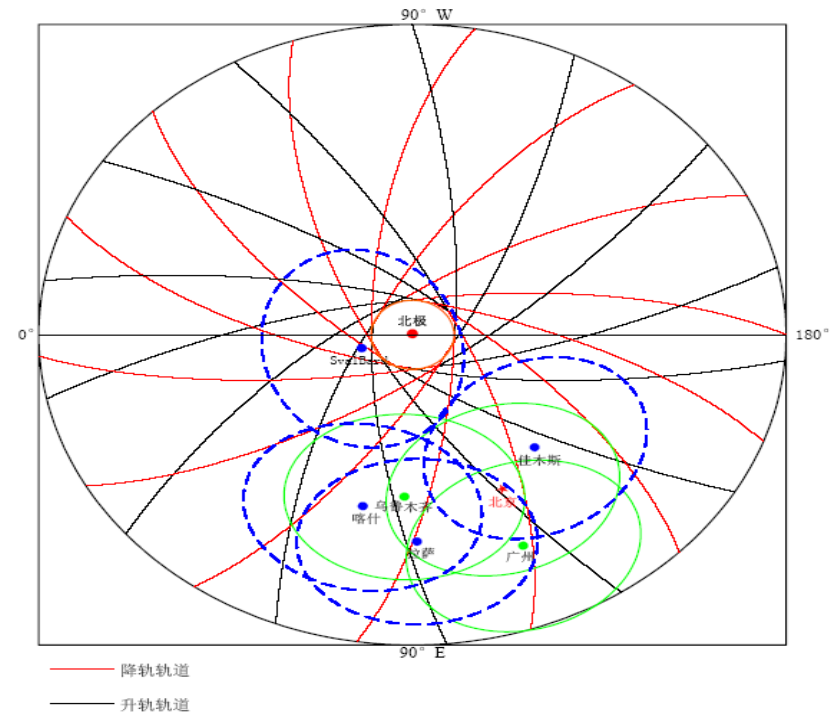


2nd Generation of LEO: FY-3



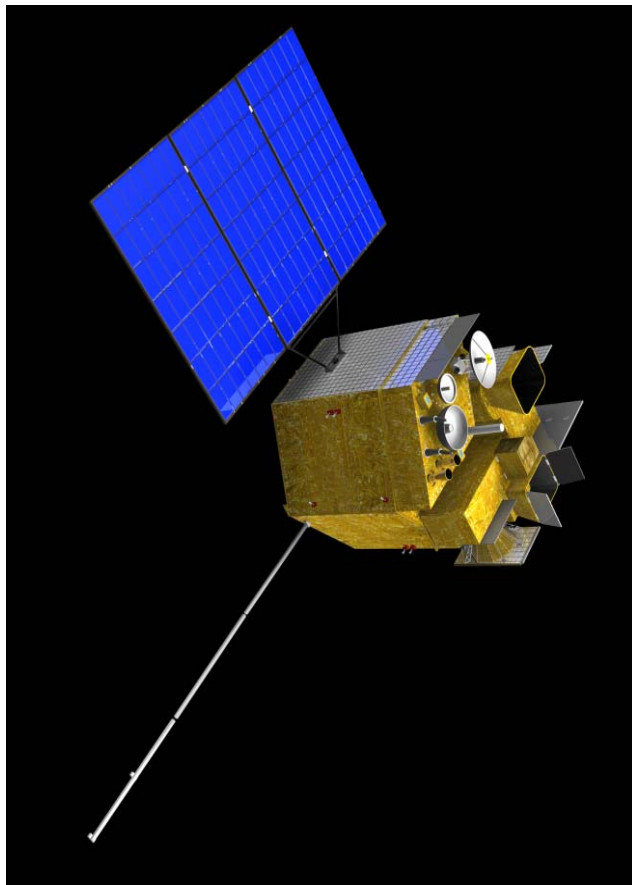
11 instruments onboard FY-3A, including:

- VIRR: Visible and Infra-Red Radiometer
- MERSI : Medium Resolution Spectral Imager
- IRAS : Infrared Atmospheric Sounder
- MWTS : MicroWave Temperature Sounder
- MWHS: MicroWave Humidity Sounder
- MWRI: MicroWave Radiation Imager
- SBUS: Solar Backscatter Ultraviolet Sounder
- TOU: Total Ozone mapping Unit
- SIM: Solar Irritation Monitor
- ERM: Earth Radiation Monitor
- SEM: Space Environment Monitor



No.	Launch	Orbit	Status
FY-3A	May 27, 2008	M	R&D
FY-3B	2010 (plan)	A	R&D
FY-3C	2012 (plan)	M	Op.
FY-3D	2014 (plan)	A	Op.
FY-3E	2016 (plan)	M	Op.
FY-3F	2018 (plan)	A	Op. ⁵

Next Generation of GEO satellite: FY-4



Prototype structure of FY-4A

4 main instruments

Advanced Geo. Radiation Imager

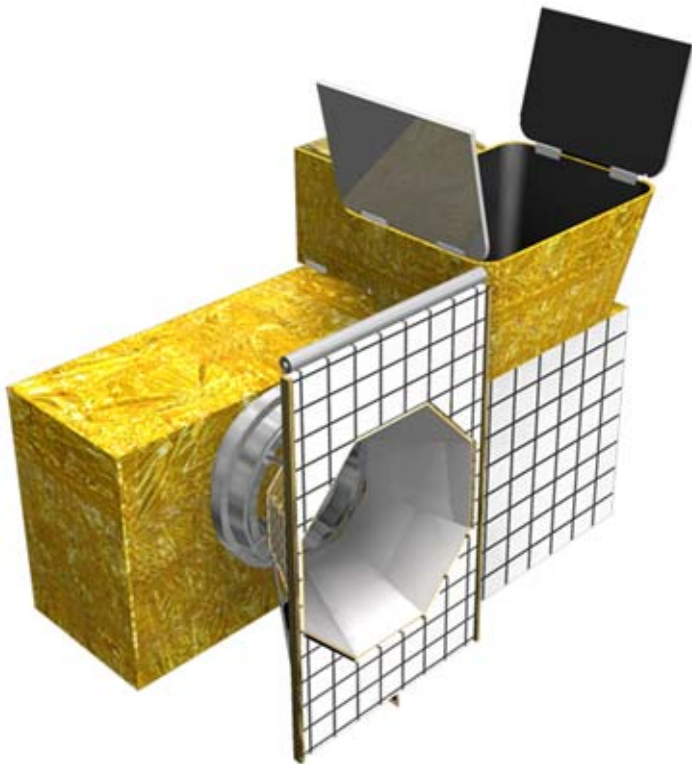
Geo. Interferometric Infrared Sounder

Lightning Mapping Imager

Solar X-EUV imaging telescope
(not available on 1st satellite)

No.	Plan Launch	Design Life	Status
FY-4A	2014	5 years	R&D
FY-4B	2017	7 years	Op.
FY-4C	2019	7 years	Op.

AGRI: Advanced Geo. Radiation Imager



1. Off-axis reflecting optics
2. Two independent scanning-mirrors for north-south and east-west directions respectively
3. Total 216 sensors for 14 bands from visible to long-wave infrared
4. Full-path on-orbit radiation calibration for all bands

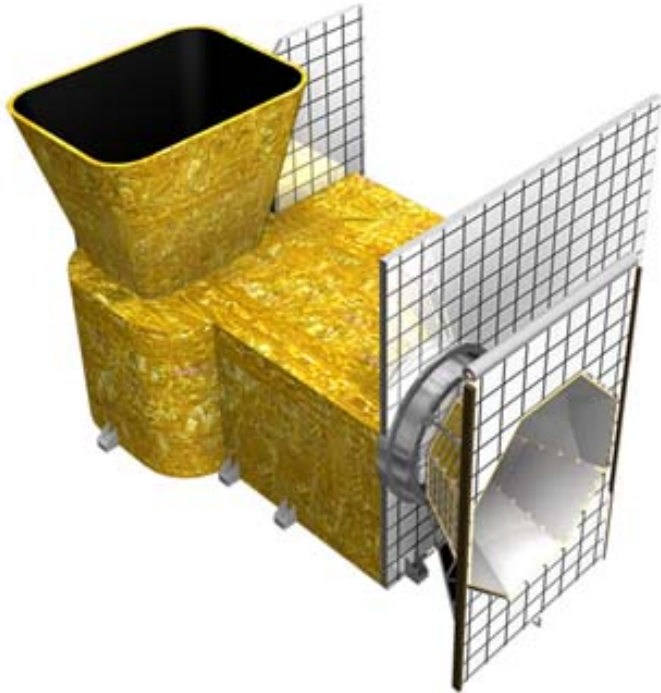
AGRI illustration

AGRI Specifications

14 Channels within 0.55~13.8 μm for first satellite FY-4A

Channel	Band (μm)	Spatial Resolution (Km)	Detection Sensitivity		Main Application
Visible & Near-Infrared	0.45 ~ 0.49	1	S/N \geq	70($\rho=100\%$)	Aerosol
	0.55 ~ 0.75	0.5 ~ 1		200($\rho=100\%$),5 ($\rho=1\%$)@0.5K m	Fog, Cloud
	0.75 ~ 0.90	1			Vegetation
Short-wave Infrared	1.36 ~ 1.39	2	S/N \geq	200 ($\rho=100\%$) 5 ($\rho=1\%$)	Cirrus
	1.58 ~ 1.64	2			Cloud, Snow
	2.1 ~ 2.35	2 ~ 4			Cirrus, Aerosol
Mid-wave Infrared	3.5 ~ 4.0(high)	2	NE Δ T \leq 0.7K(300K)		Fire
	3.5 ~ 4.0(low)	4	NE Δ T \leq 0.2K(300K)		Land surface
Water Vapor	5.8 ~ 6.7	4	NE Δ T \leq 0.3K(260K)		WV
	6.9 ~ 7.3	4	NE Δ T \leq 0.3K(260K)		WV
Long-wave Infrared	8.0 ~ 9.0	4	NE Δ T=0.2K(300K)		WV, Cloud
	10.3 ~ 11.3	4	NE Δ T=0.2K(300K)		SST
	11.5 ~ 12.5	4	NE Δ T=0.2K(300K)		SST
	13.2 ~ 13.8	4	NE Δ T=0.5K(300K)		Cloud, WV

GIIRS: Geo. Interferometric Infra-Red Sounder



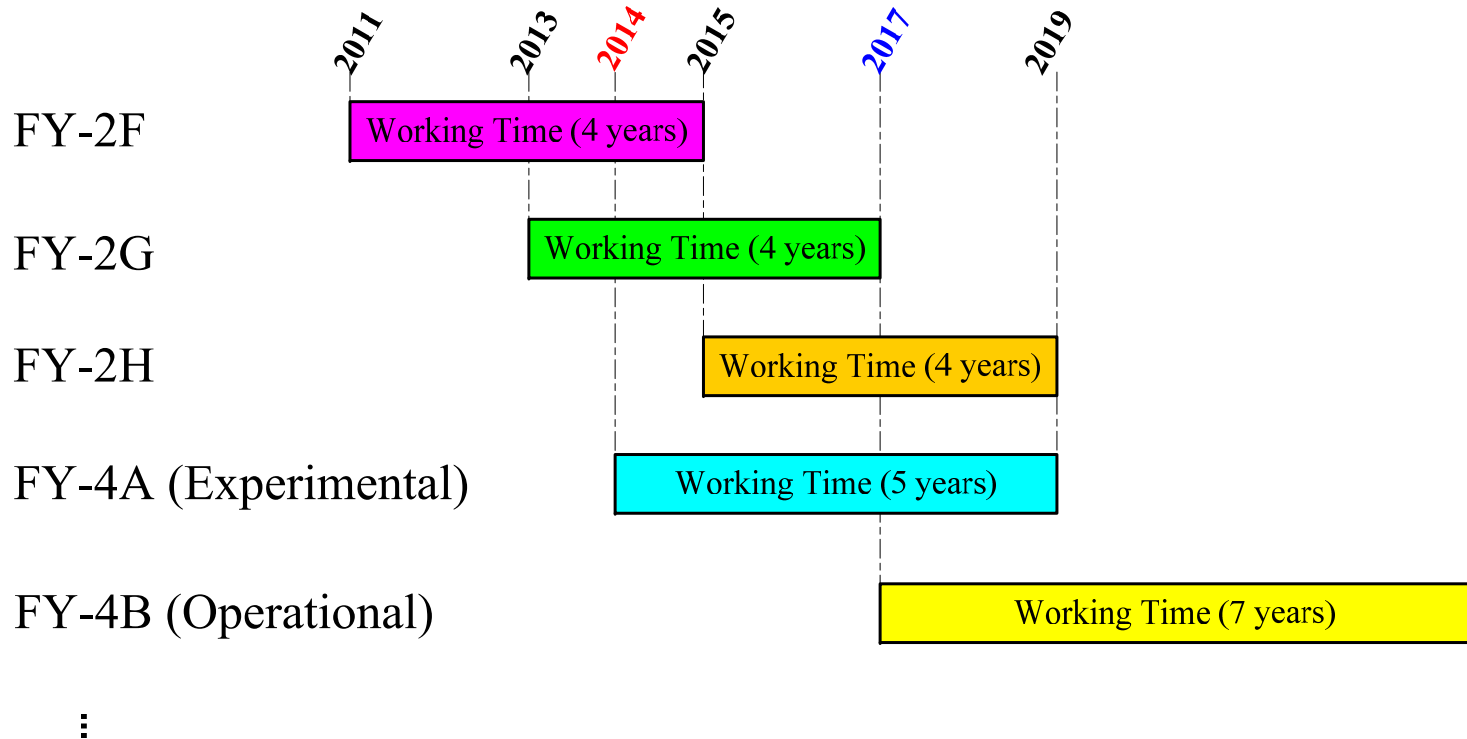
1. Off-axis reflecting optics
2. Two independent scanning-mirrors for north-south and east-west directions respectively
3. 16×16 focal plane arrays for mid-wave and long-wave infrared bands
4. Active and radiate coolers

GIIRS configuration

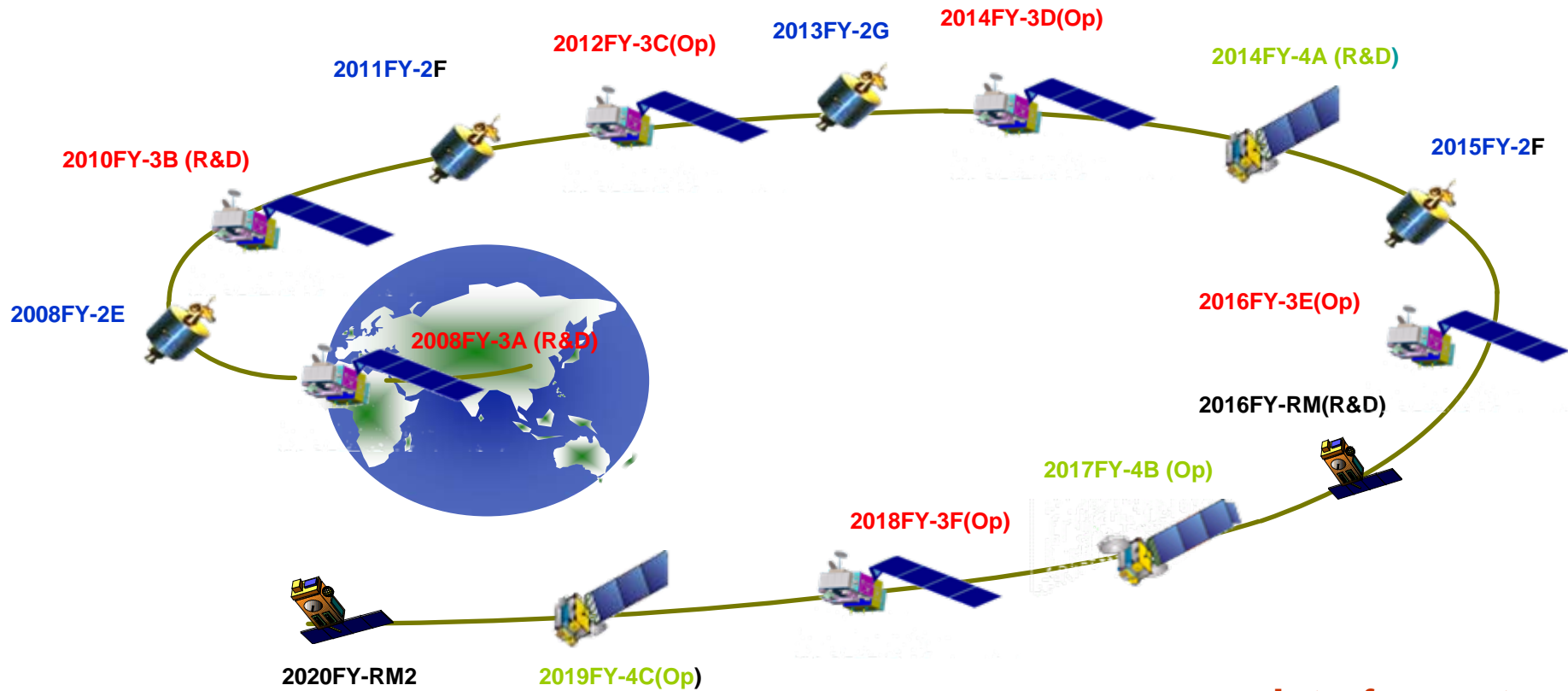
GIIRS: Specifications

	R&D			Operational		
Spectral Parameters (cm ⁻¹)	Spectrum Range LWIR: 700-1130 S/MIR:1650-2250	Resolution 0.8 1.6	Channels 538 375	Spectrum Range LWIR: 700-1130 S/MIR:1650-2250	Resolution 0.625 1.2	Channels 688 500
Spatial Resolution	At Nadir: 16Km IFOV: 448μrad			At Nadir: 8Km IFOV: 224μrad		
Operational Mode	China area 5000 × 5000 Km ² Mesoscale area 1000 × 1000 Km ²			China area 5000 × 5000 Km ² Mesoscale area 1000 × 1000 Km ²		
Temporal Resolution	China area 1 hr Mesoscale area ½ hr			China area about 1 hr Mesoscale area about ½ hr		
Sensitivity (mW/m ² sr cm ⁻¹)	LWIR: 0.5 S/MIR: 0.1			LWIR: 0.3 S/MIR: 0.06		
Calibration accuracy of radiation	1.5k (3σ)			1.0k (3σ)		
Calibration accuracy of spectrum	10 ppm (3σ)			5 ppm (3σ)		
Quantization Bits	13 bits			13 bits		

Transition from FY-2 to FY-4



Road Map of FENGYUN Meteorological Satellites Development by Year 2020



Interferometer

Mission	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15													
FY1	■				■												■		■		■		■		■		■		■		■		■		■							
	▲A		▲B		▲C				▲D		▲A		▲B		▲C		▲D		▲E		▲A		▲B		▲C		▲A		▲A		▲A											
FY2	■												■												■		■		■		■		■		■		■		■		■	
	▲A				▲B				▲C				▲D				▲E				▲A		▲B		▲C		▲A		▲A		▲A		▲A									
FY3	■												■												■		■		■		■		■		■		■		■		■	
	▲A				▲B				▲C				▲D				▲E				▲A		▲B		▲C		▲A		▲A		▲A											
FY4	■												■												■		■		■		■		■		■		■		■		■	
	▲A				▲B				▲C				▲D				▲E				▲A		▲B		▲C		▲A		▲A		▲A											



Thank you