The status and future plan of China's FengYun Meteorological Satellite Programs

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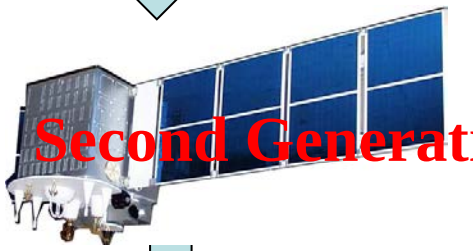
Chinese Meteorological Satellite: FengYun Series

Polar System

FY
|
1A
1B
1C
1D

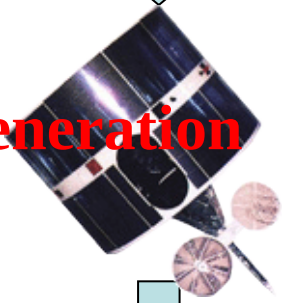
First Generation



Second Generation

FY
|
3A
3B
3C
…
3F

Geostationary System



First Generation

Second Generation

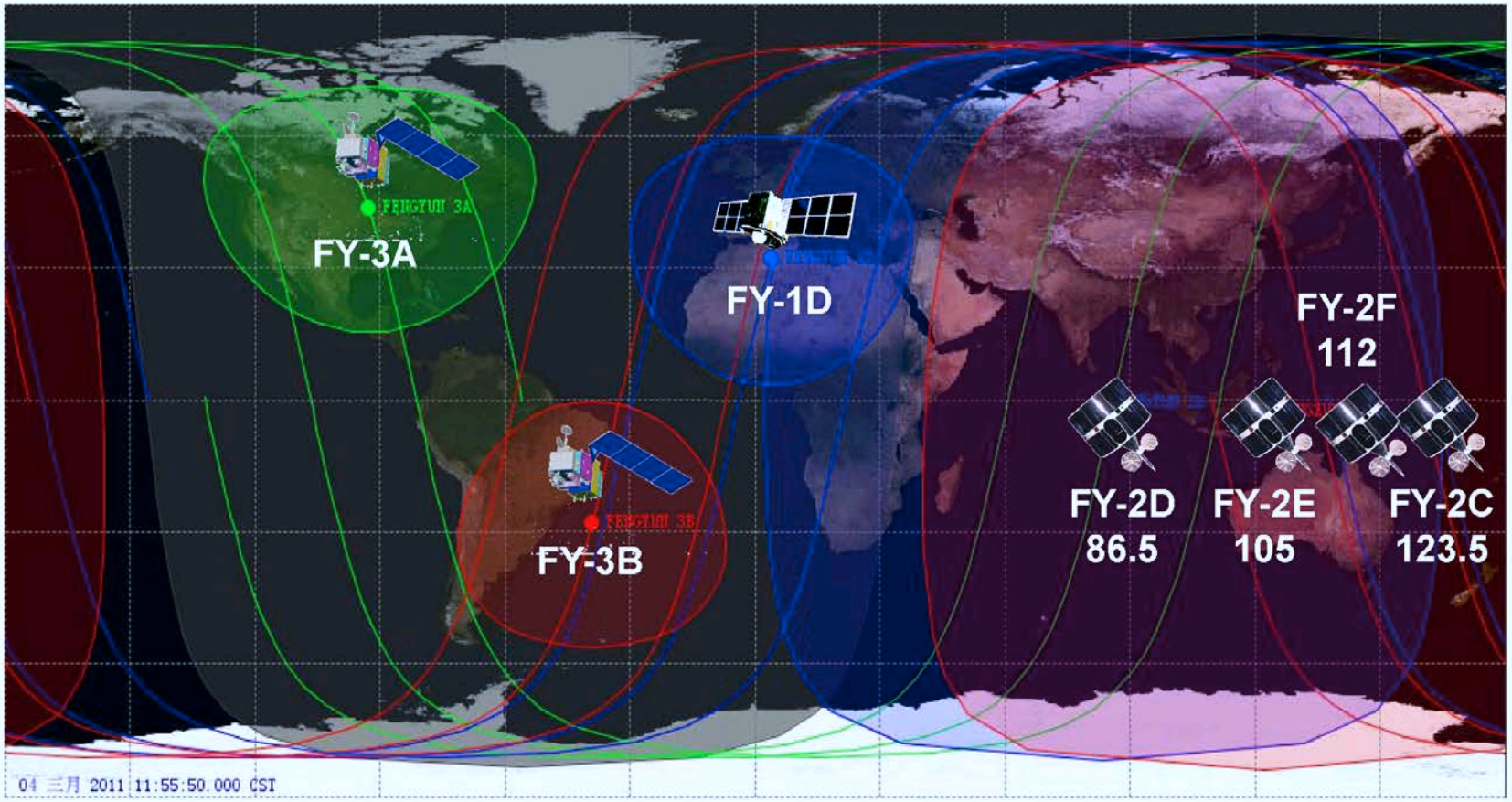
FY
|
2A
2B
2C
2D
2E
2F

FY
|
4A
4B
4C
…

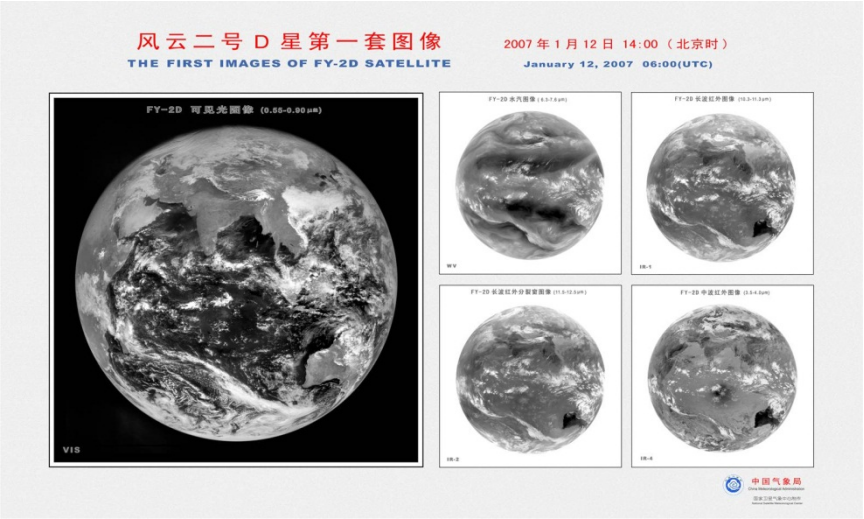
Launched Satellites

Since Jan. 1969, China began to develop his own meteorological Satellite				
Leo	Launch Data		Geo	Launch Data
FY-1A	Sept. 7, 1988		FY-2A	Jun. 10, 1997
FY-1B	Sept. 3, 1990		FY-2B	Jun. 25, 2000
FY-1C	May 10, 1999		FY-2C	Oct. 18, 2004
FY-1D	May 15, 2002		FY-2D	Dec. 8, 2006
FY-3A	May 27, 2008		FY-2E	Dec. 23, 2008
FY-3B	Nov 5, 2010		FY-2F	Jan. 13, 2012

On-orbit Satellites



FengYun GEO. Satellites: FY-2



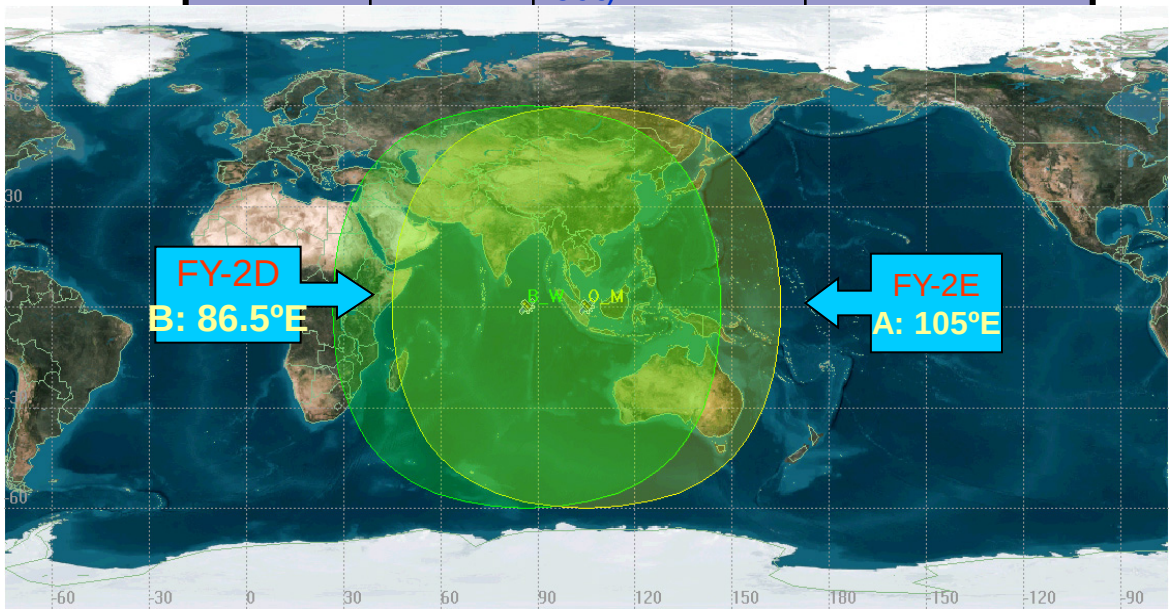
No.	Pos.	Status	Launch
FY-2A	105E	Exp. (dead)	Jun.10, 1997
FY-2B	105E	Exp. (dead)	Jun.20, 2000
FY-2C	105E	Op. (spare)	Oct.18, 2004
FY-2D	86.5E	Op. (working)	Dec.8, 2006
FY-2E	105E	Op. (Working)	Dec.23, 2008
FY-2F	112E	Op. (Check-out)	Jan.13, 2012

Platform: Spin stabilization

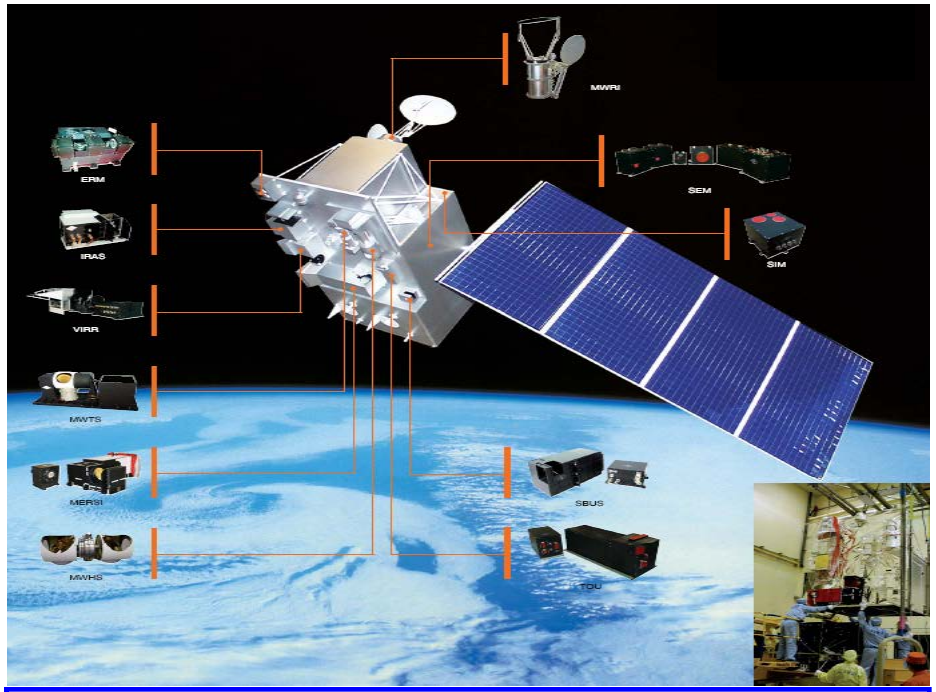
Payload: 5 chl. VISSR

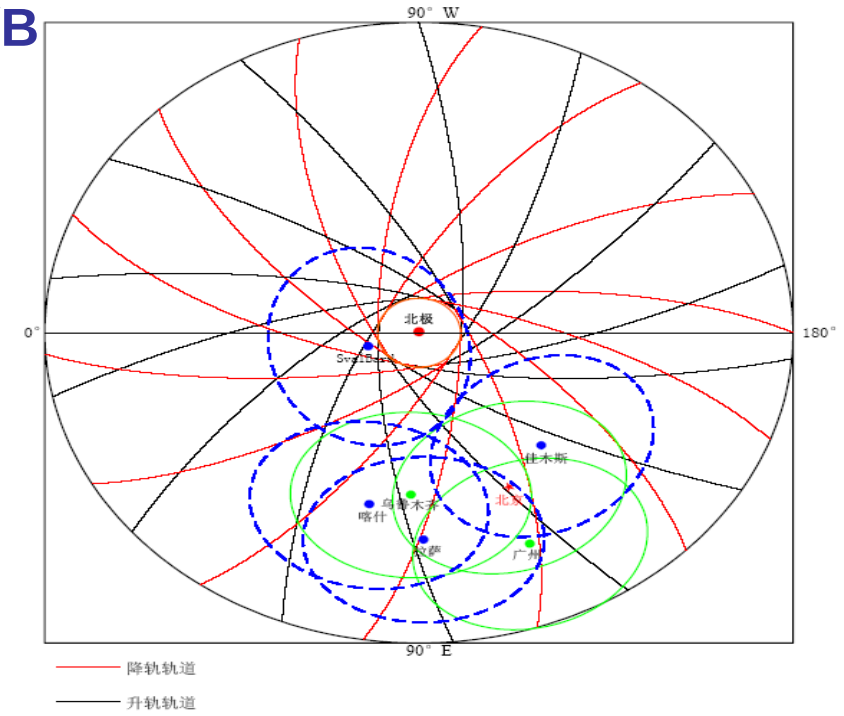
Full Disc: every 30 min. at most

- ✓ FY-2E & FY-2D are working together to implement 15 min. interval obs.
- ✓ FY-2E took over FY-2C in Dec. 2009!



Current 2nd Generation of LEO: FY-3A/B





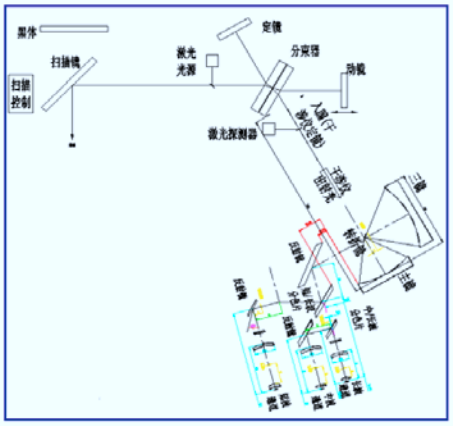
11 instruments onboard FY-3A, including:
VIRR: Visible and Infra-Red Radiometer
MERSI： Medium Resolution Spectral Imager
IRAS： Infrared Atmospheric Sounder
MWTS：MicroWave Temperature Sounder
MWHS: MicroWave Humidity Sounder
MWRI: MicroWave Radiation Imager
SBUS: Solar Backscatter Ultraviolet Sounder
TOU: Total Ozone mapping Unit
SIM: Solar Irritation Monitor
ERM: Earth Radiation Monitor
SEM: Space Environment Monitor

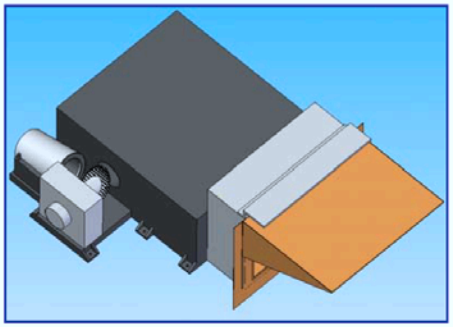
No.	Launch	Orbit	Status
FY-3A	May 27,2008	M	R&D
FY-3B	Nov 05,2011	A	R&D
FY-3C	2013 (plan)	M	Op.
FY-3D	2015 (plan)	A	Op.
FY-3E	2017 (plan)	M	Op.
FY-3F	2019 (plan)	A	Op.

Next update on 2nd generation FY-3 series

FY-3 OPERATIONAL SATELLITE INSTRUMENTS	FY-3C	FY-3D	FY-3E	FY-3F
MERSI – Medium Resolution Spectral Imager (Ⅰ, Ⅱ)	√(Ⅰ)	√(Ⅱ)	√(Ⅱ)	√(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)		√(Ⅱ)	
SIM – Solar irritation Monitor (Ⅰ, Ⅱ)	√(Ⅰ)		√(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.





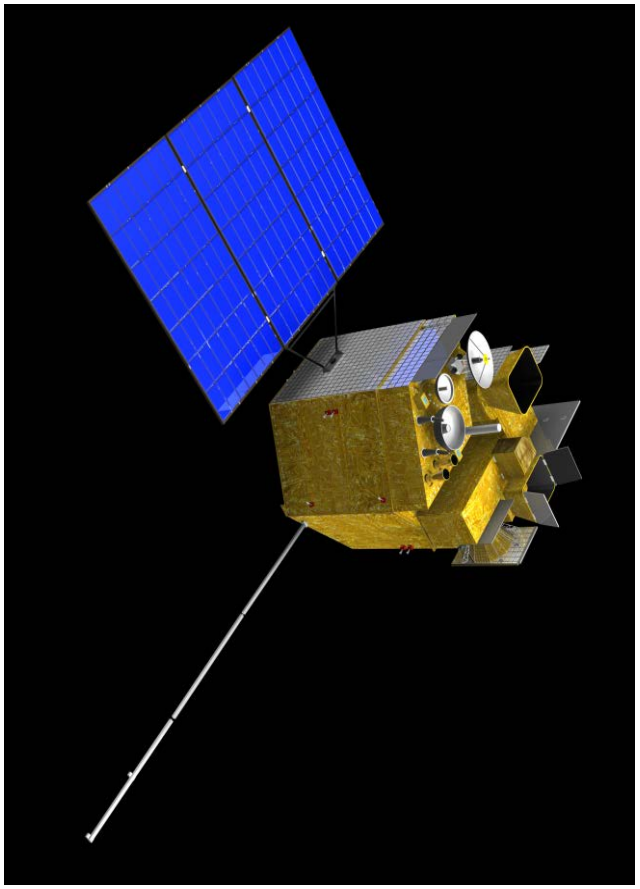
HIRAS Specification

Specification	LWIR Band	MWIR Band	SWIR Band
Spectral Range	650 – 1136 cm-1	1210 – 1750 cm-1	2155-2550 cm-1
Spectral Res	0.625 cm-1	1.25 cm-1	2.5 cm-1
NEΔT @250K	0.15~0.4K	0.1~0.7K	0.3~1.2K
pixes per scan line	58		
Scan Angle	±50.4° around nadir		
Spatial Res	1.1 degrees (16.0km) IFOV at arranged in 2×2 array		
Power/Mass	129watts/120kg		

HIRAS/FY-3: Michelson interferometer
Aims: global temperature and moisture sounding from the infrared spectrum from 650 to 2550 cm−1

1) **retrieving atmospheric temperature and humidity profiles with high accuracies for numerical weather prediction and climate research at high vertical resolution.**
2) **Trace gases to be derived from HIRAS include ozone columnar amounts in deep layers and columnar amounts of carbon monoxide, nitrous oxide, methane, and carbon dioxide.**
3) **Cloud parameters .**

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

Space Environmental Package
(not available on 1st satellite)

No.	Plan Launch	Design Life	Status
FY-4A	2015	5 years	R&D
FY-4B	2017	7 years	Op.
FY-4C	2020	7 years	Op.

GIIRS: Specifications

	FY-4A(R&D)	FY-4B(Operational)
Spectral Parameters (cm^{-1})	Spectrum Range / Resolution / Channels LWIR: 700-1130 / 0.8 / 538 S/MIR:1650-2250 / 1.6 / 375	Spectrum Range / Resolution / Channels LWIR: 700-1130 / 0.625 / 688 S/MIR:1650-2250 / 1.2 / 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 ($mW/m^2sr\ cm^{-1}$)	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

Road Map of FENGYUN Meteorological Satellites Development by Year 2020