CMA Fengyun Geostationary satellites ground segment overview: data and products

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(CMA/NSMC/OSPP)

Many thanks to Xiaohu Zhang,Lei Yang, BoYang Chen, Di Xian, Chunqiang Wu, Liqin Hu, Ran You, Ling Gao, Peng Cui, Xi Wang, Xiao Wu Zhe Xu,Yixuan Shou,Hui Liu, Sujuan Wang and other contributors from FY-4 Ground segment development team

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Outline

1)CMA GEO Satellite Mission overview

2)FY-2/4 Ground Segment overview

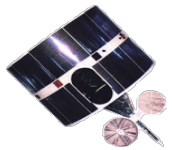
3)FY-2/4 Capabilities

4)FY-2/4 Products

5)Data and Utilities

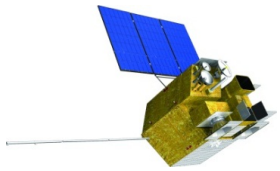
6)Summary

CMA GEO satellite Mission overview



First Generation

FY-2H	112.0E	2012
FY-2G	99.5E	2014
FY-2F	79.0E	2018



Second Generation

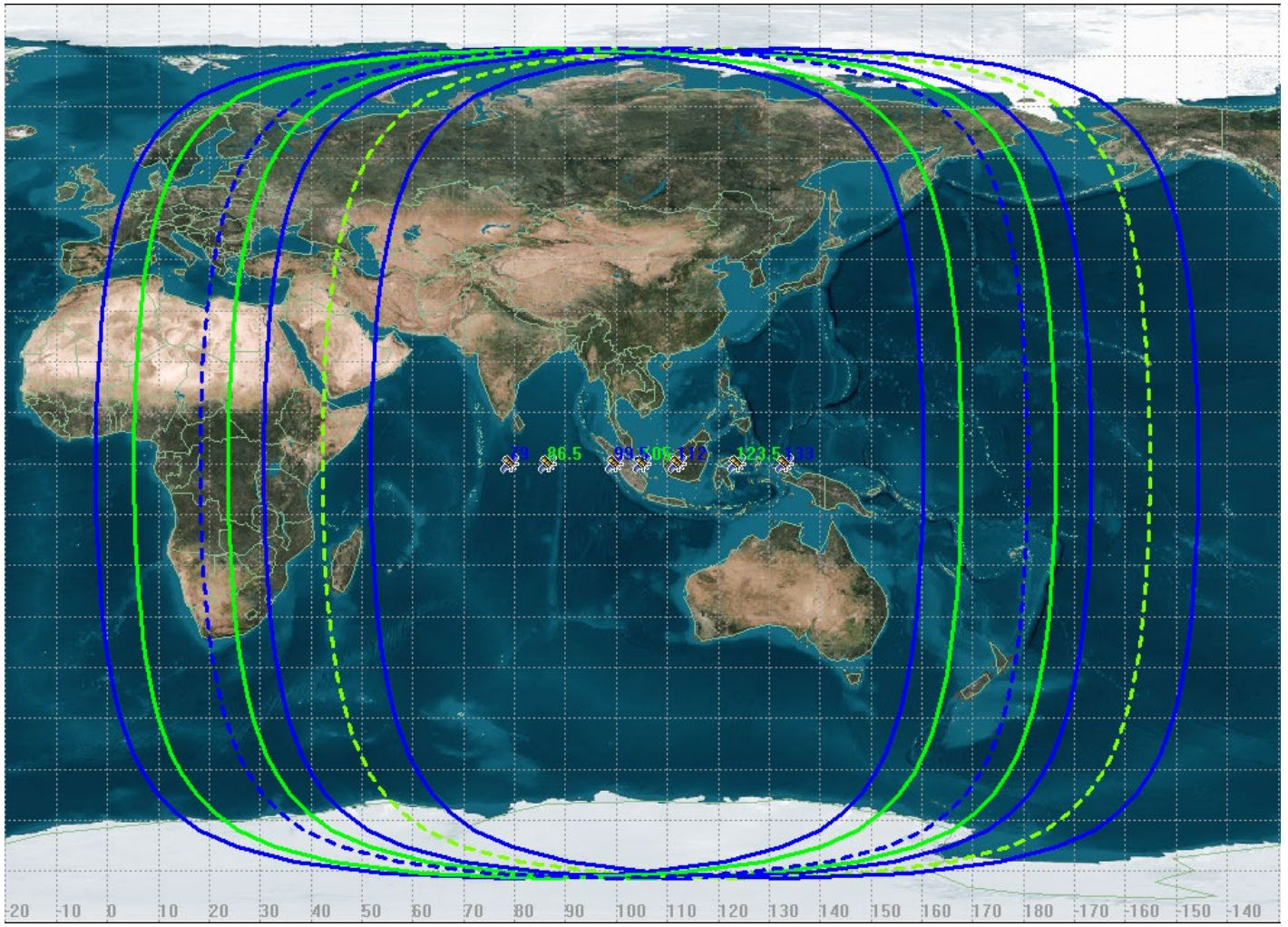
FY-4A 105E 2016

1、 Support nowcasting and severe weather warning

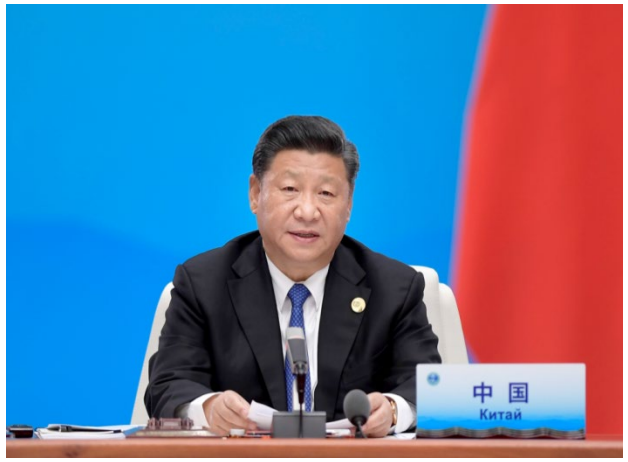
2 、Support NWP, regional and global

3 、Support climate applications

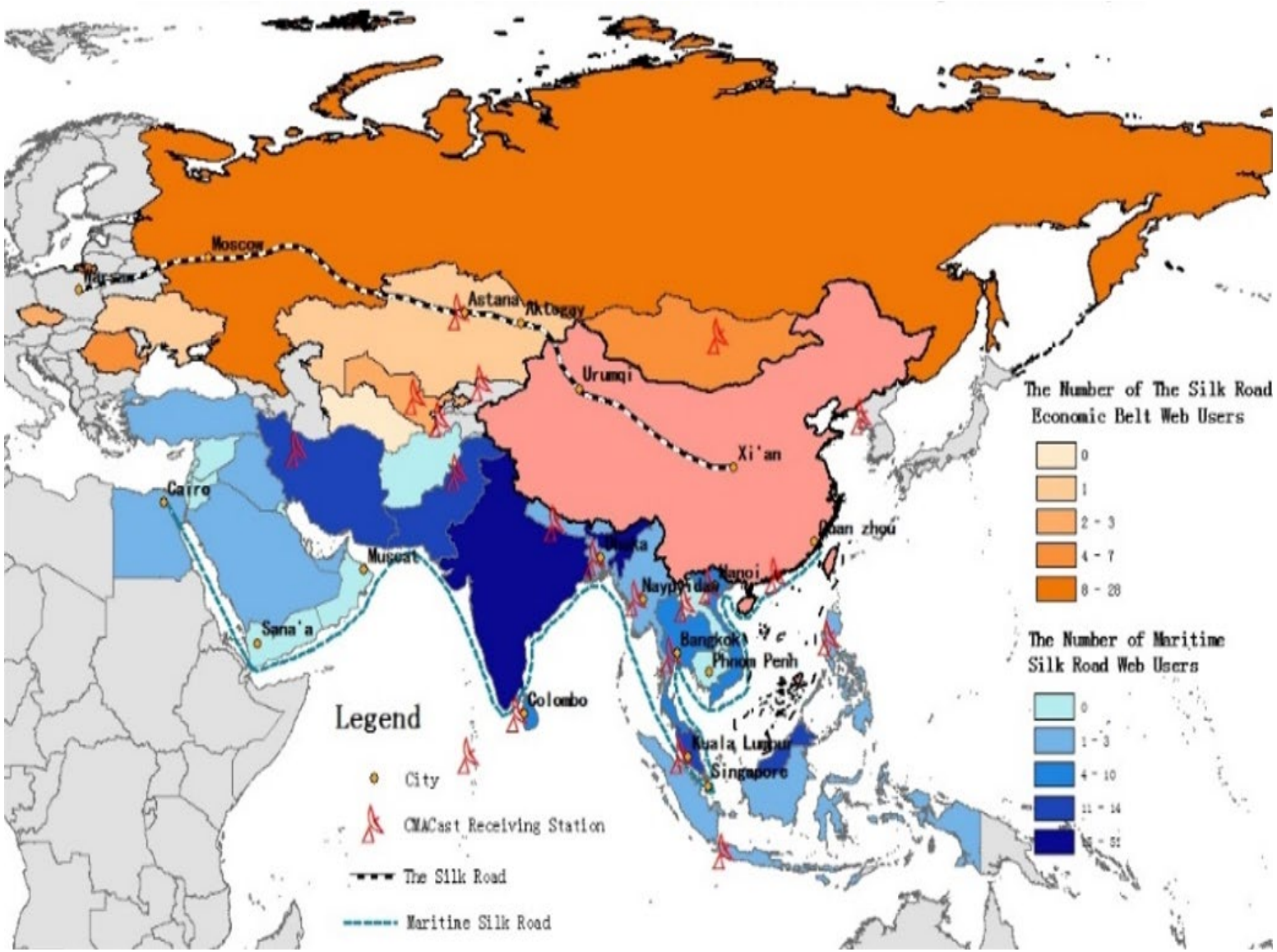
4 、Support environment monitoring and disaster mitigation



CMA FengYun GEO Special support to SCO countries

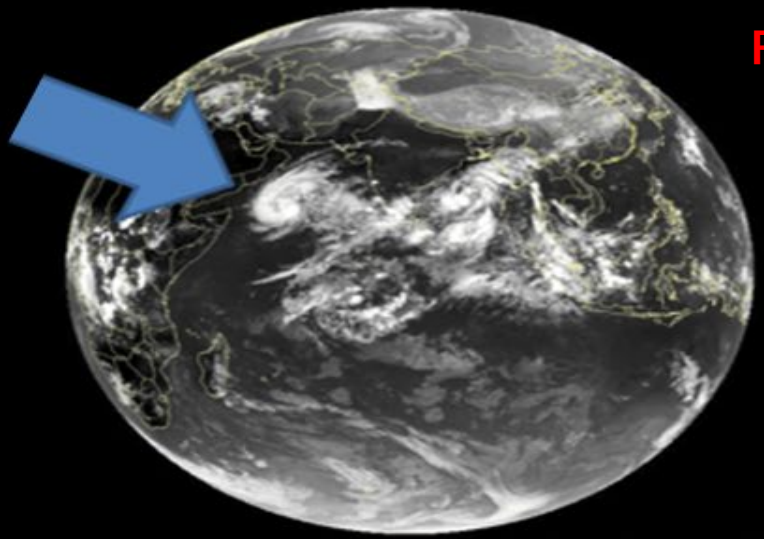


On June 10, at Shanghai Cooperation Organisation(SCO) summit in Qingdao, Chinese President Xi Jinping made a commitment that China will provide meteorological services by using FY-2 meteorological satellite."

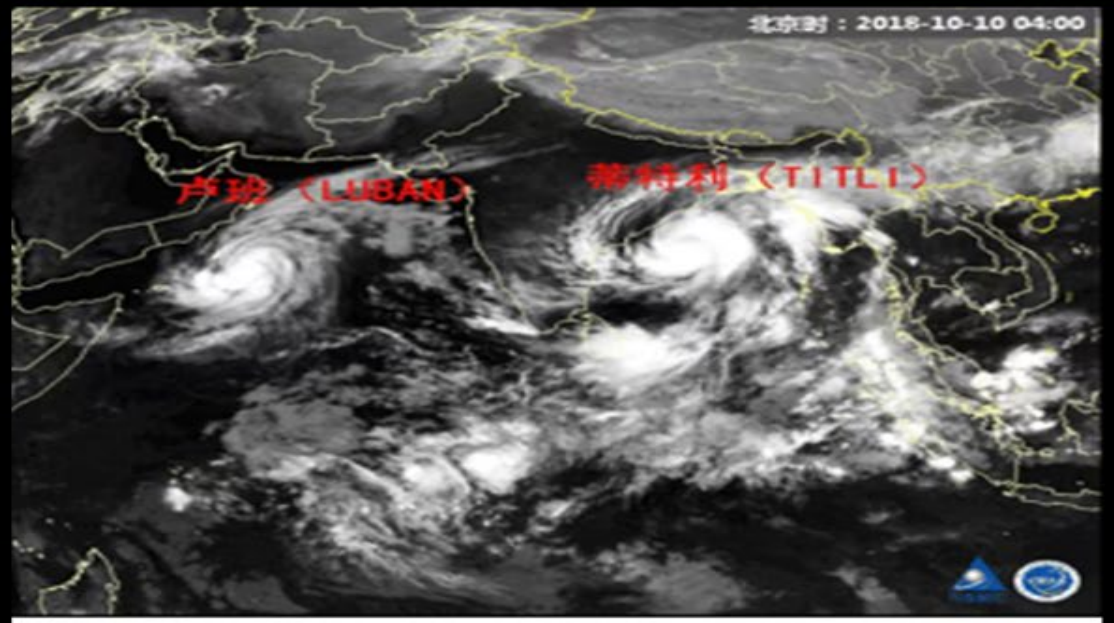


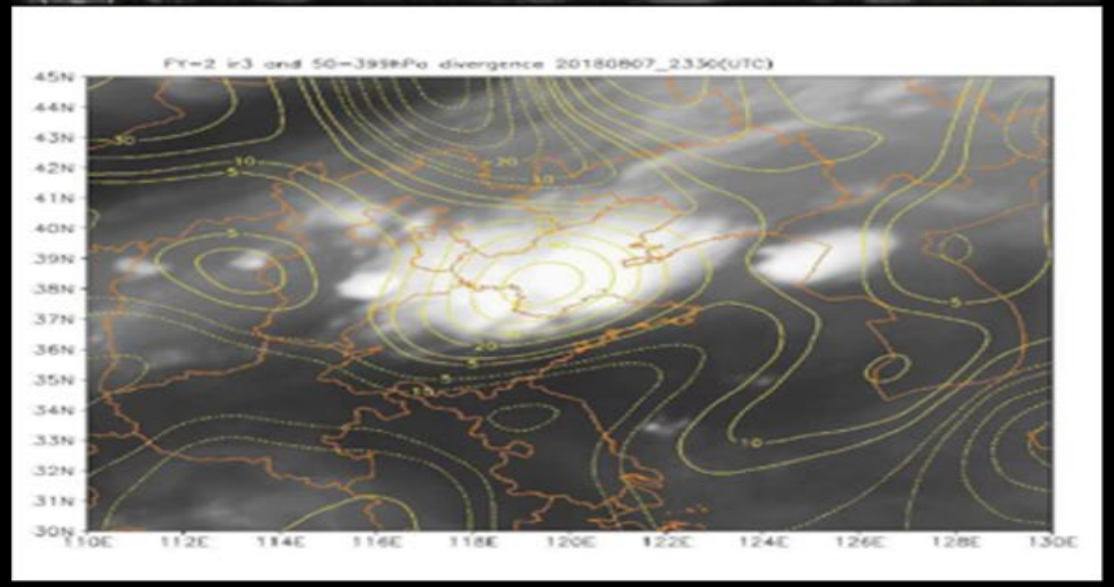
CMA FengYun GEO Special support to SCO countries

FY-2H (79E)



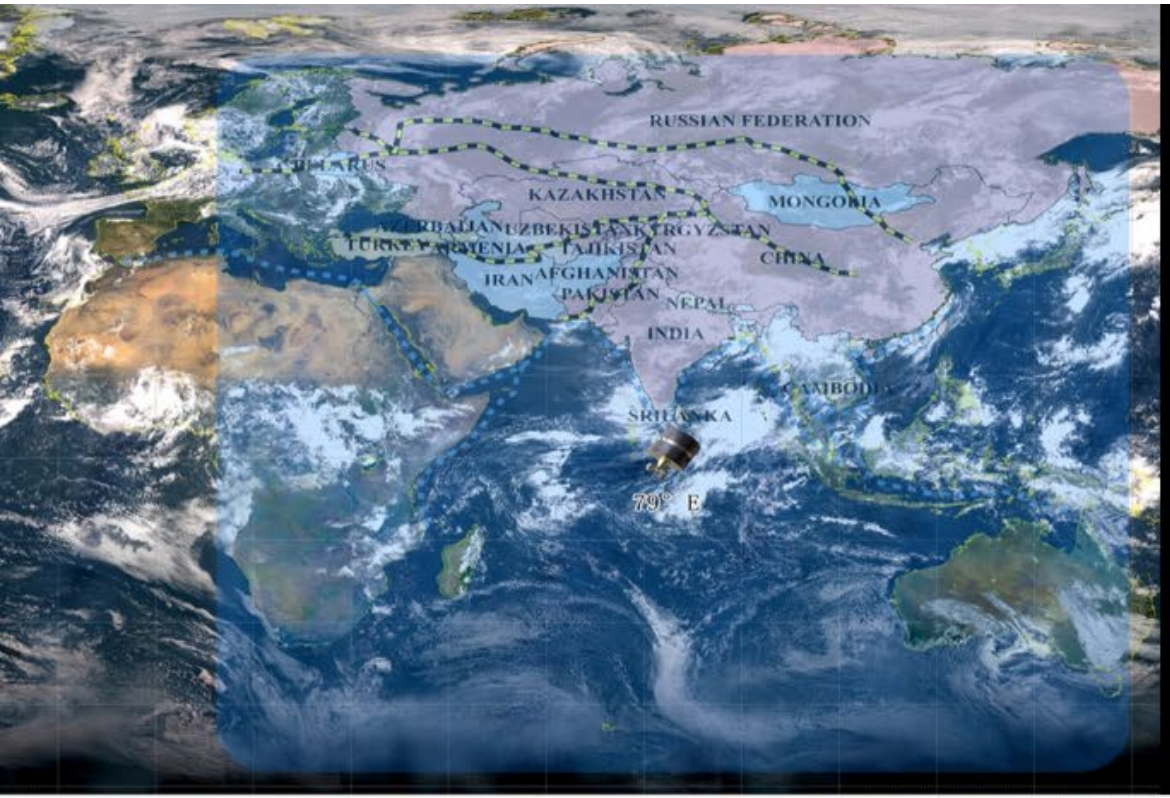
FY-2G (99.5E)

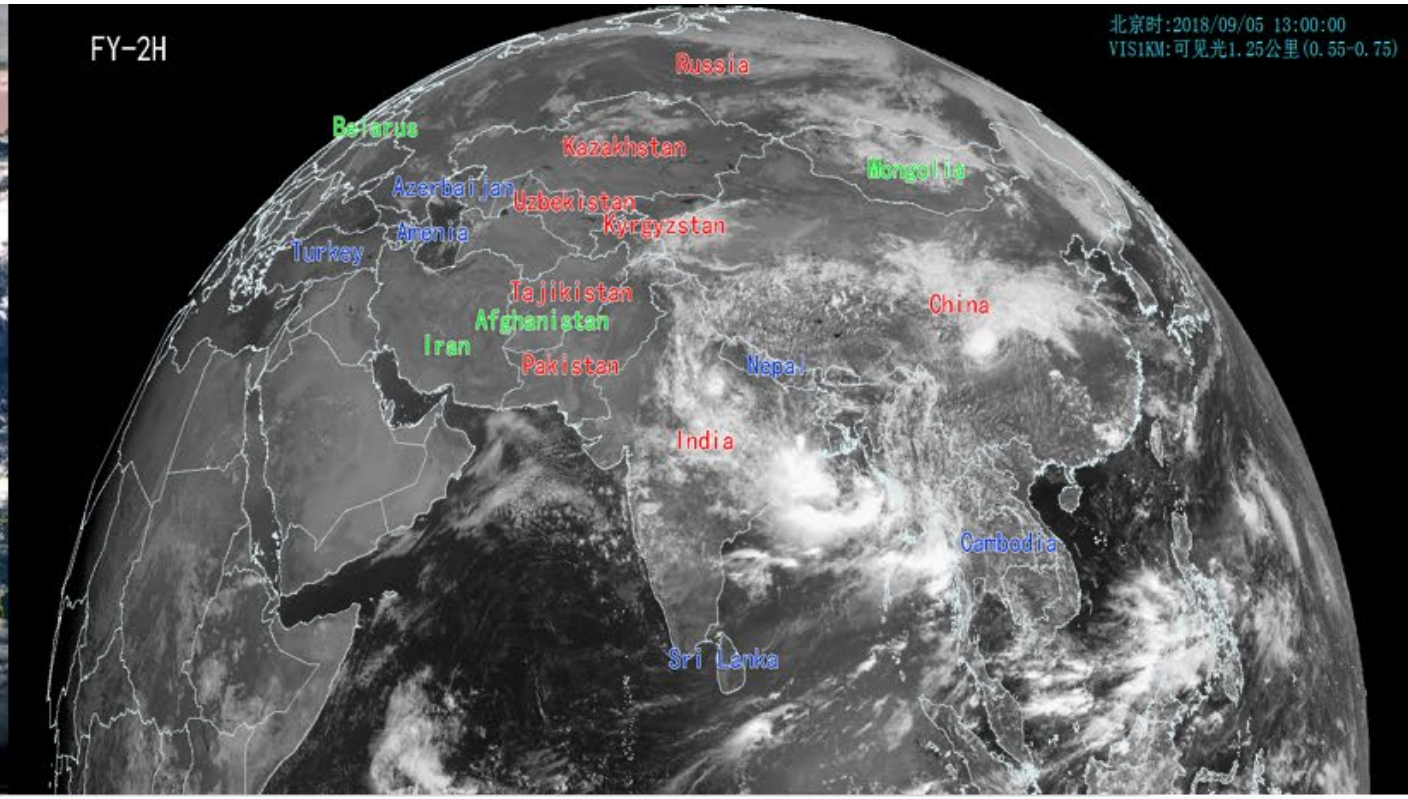




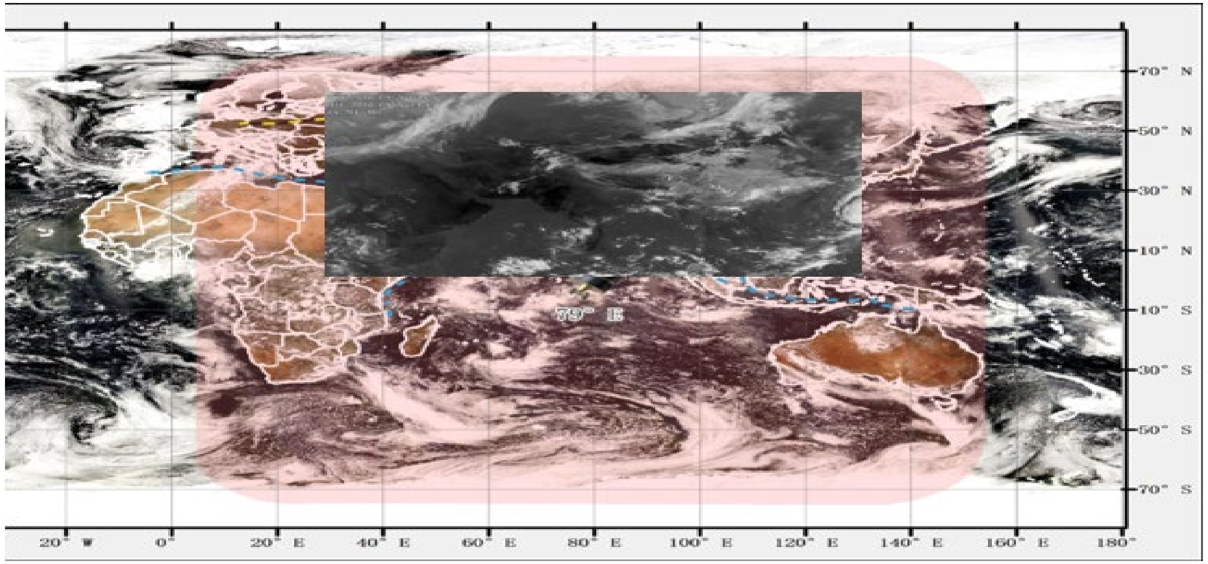
CMA FengYun GEO Special support to SCO countries

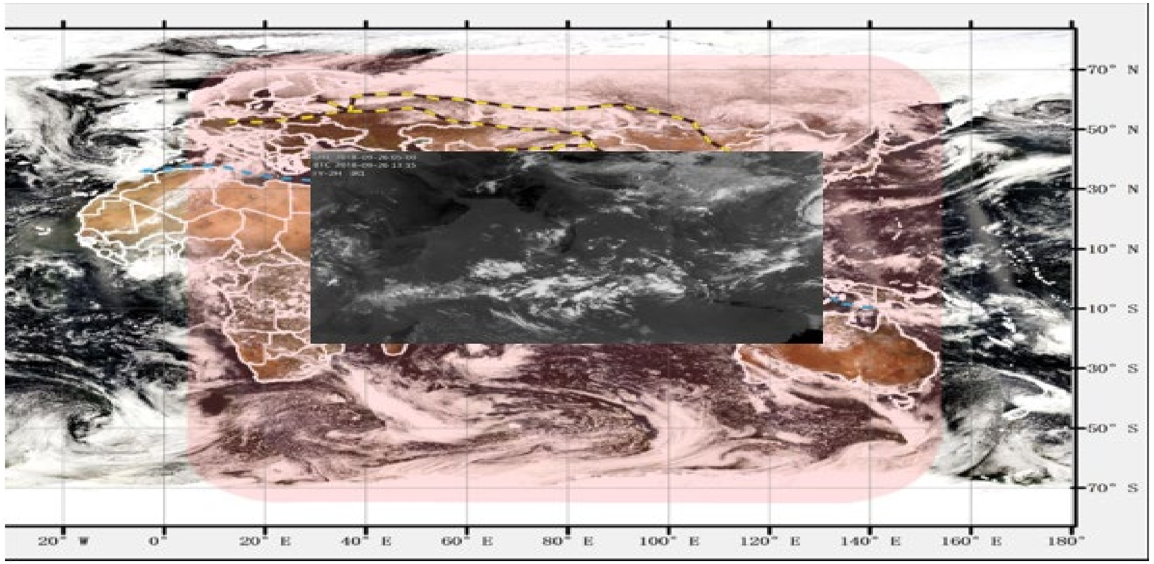
- **FY-2H** Launched on June 5, 2018 , positioned at 79°E
- FY-2H provide operational service over the Indian Ocean. Which could perform the flexible regional observations about 6-min interval over the Indian Ocean under request.

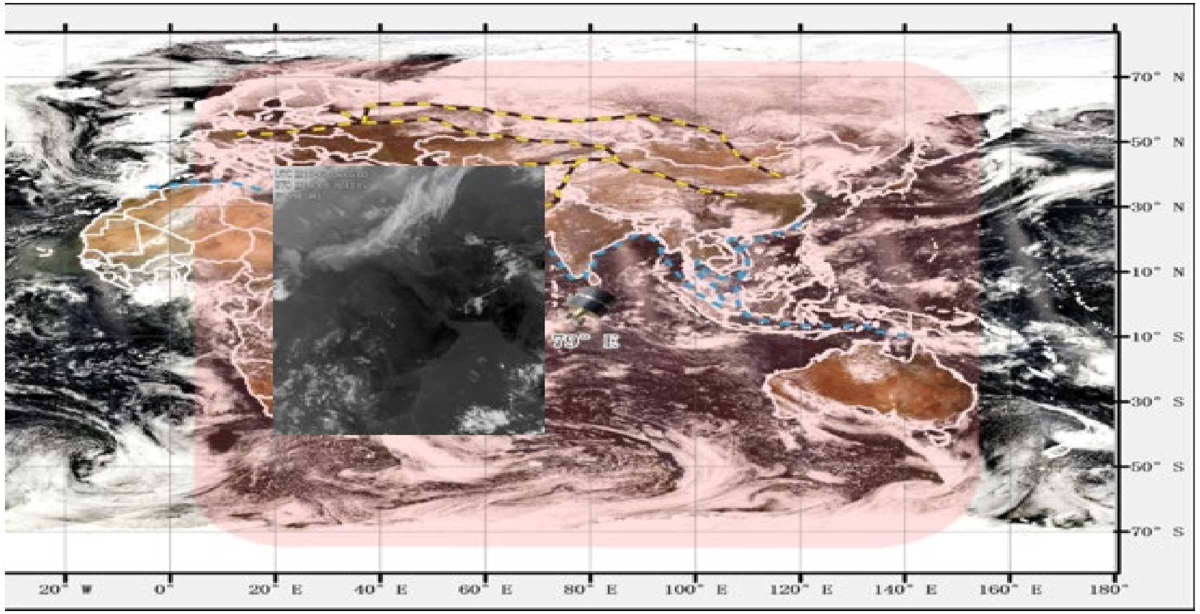


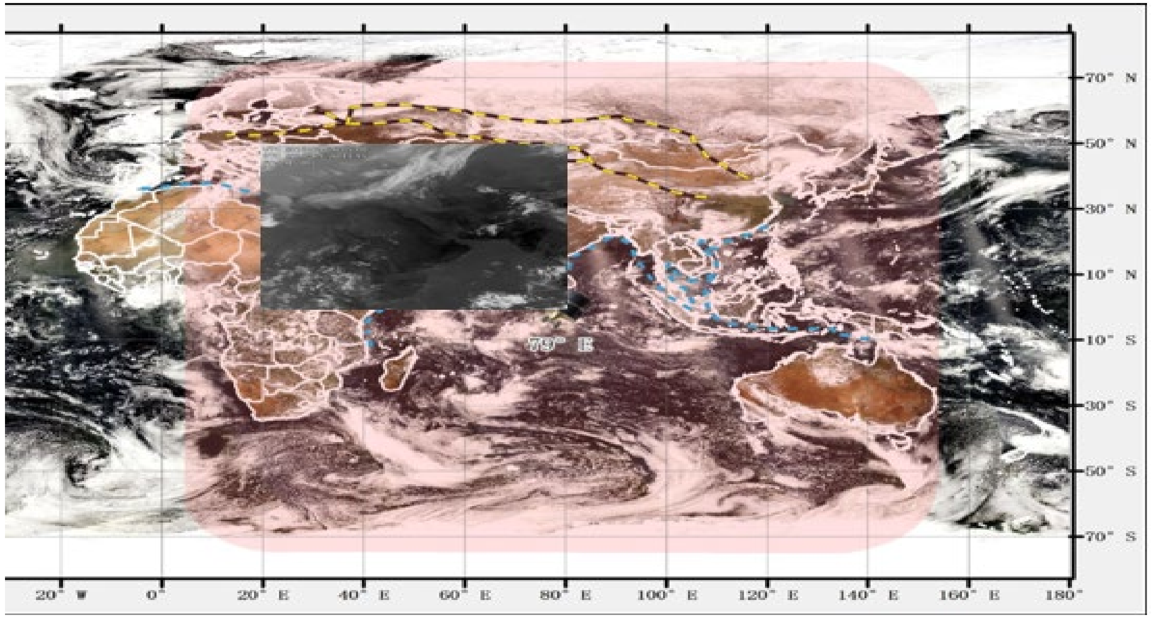


CMA FengYun GEO Special support to SCO countries









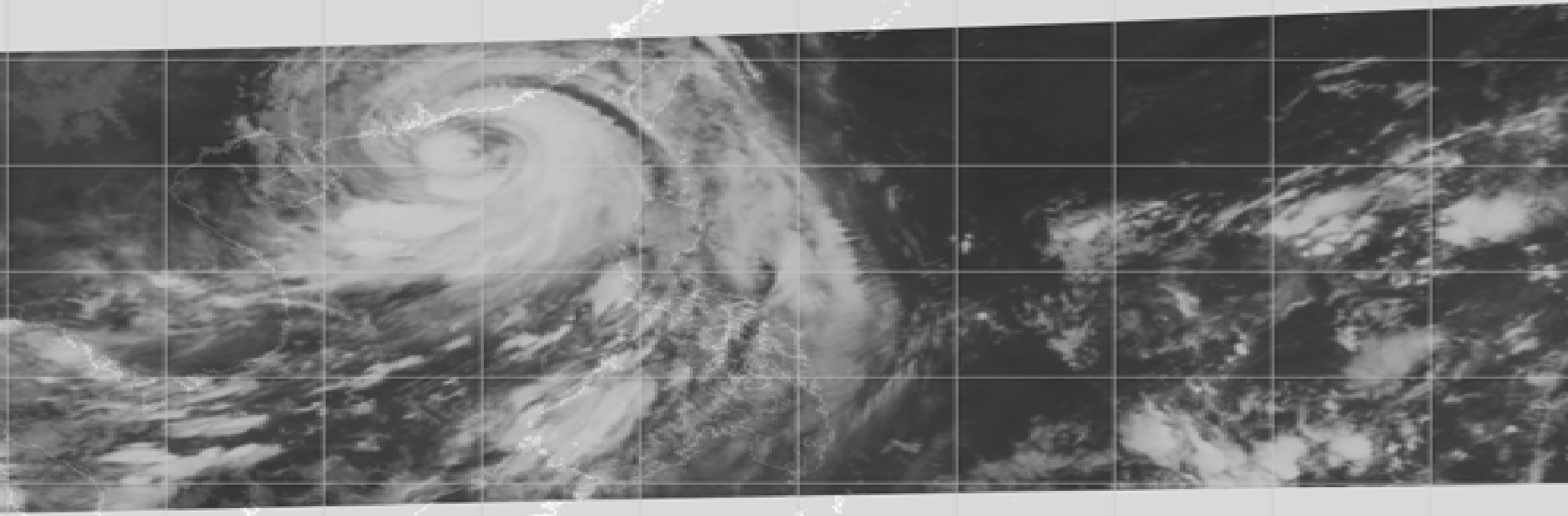
CMA Announced “Emergency Support Mechanism for International Users of Fengyun Meteorological Satellites in Disaster Prevention and Mitigation” on June 24, 2018

- **To serve the countries along the “Belt and Road” in a timely manner. These countries may raise a request for the activation of the mechanism through their respective Permanent Representatives with WMO or their designated focal points.**
- **Once the request is approved, CMA will command the on-duty FY satellite for frequent and targeted observations per 5-6 minutes over affected areas.**
- **The images and products will be transmitted to the requesting applicant through CMACast, internet and direct satellite broadcast reception.**

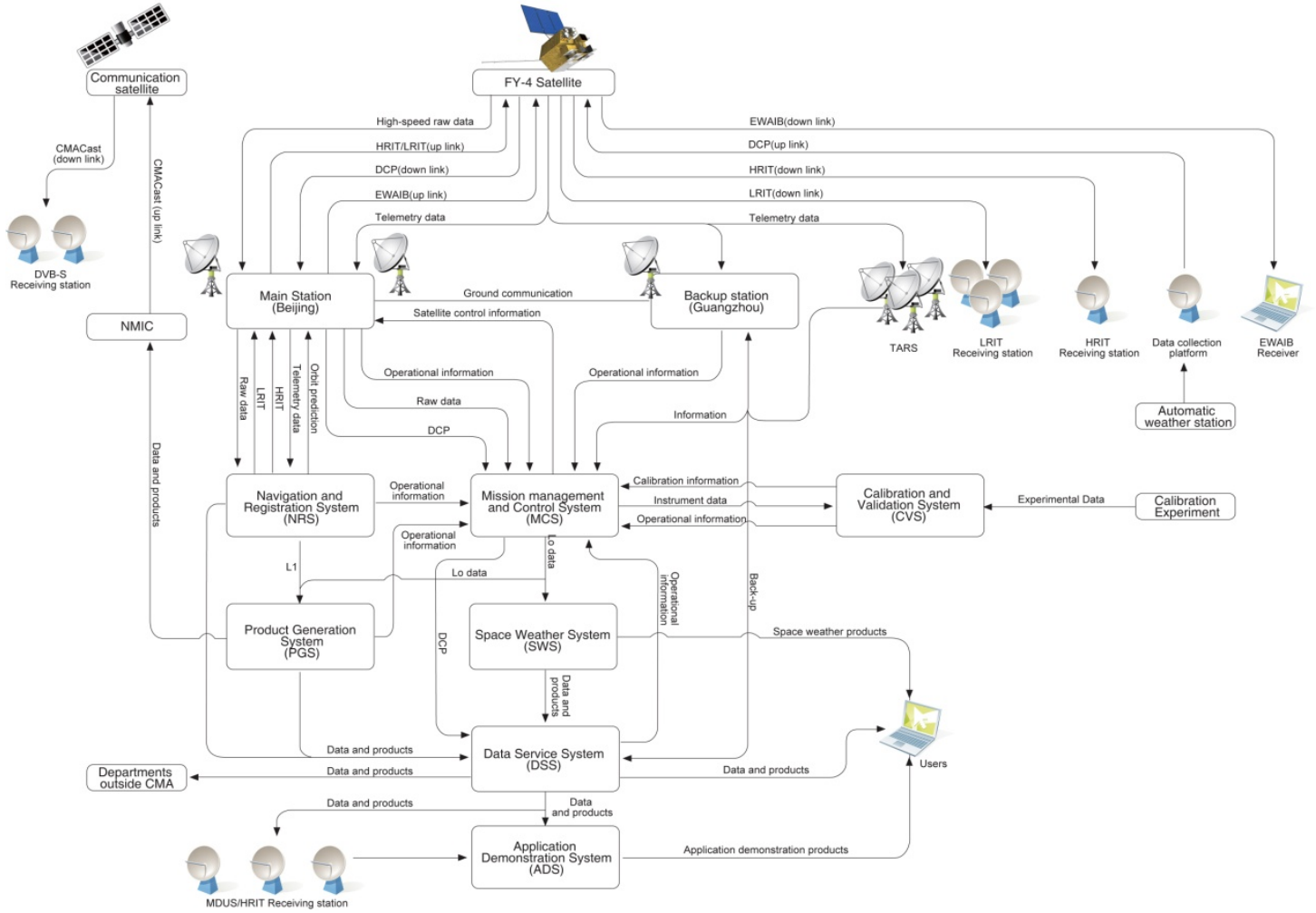
FY-ESM case: Typhoon Mangkhut

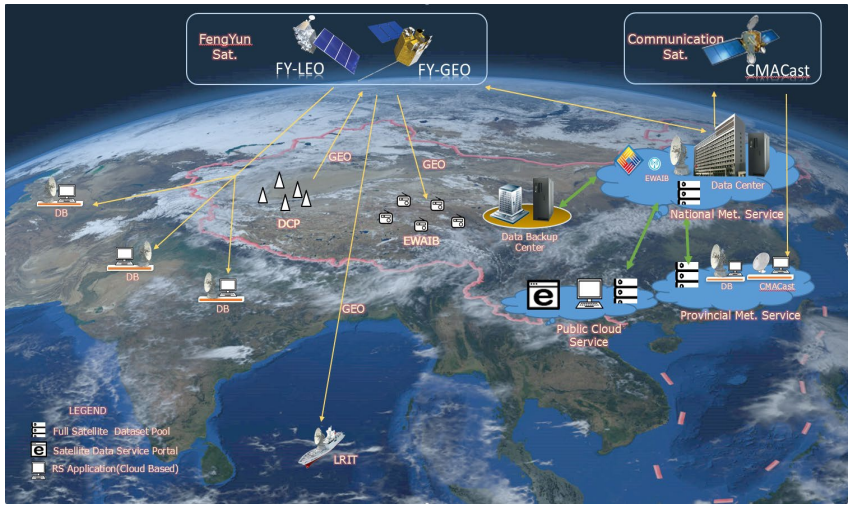
Vietnam “Disaster Management Center” and “Meteorological and Hydrological Administration” initiated a FY-ESM

CMA started a FY-2F 6-min Regional Observation from 14th to 16th Sep. 2018



FY-2/4 Ground Segment Overview



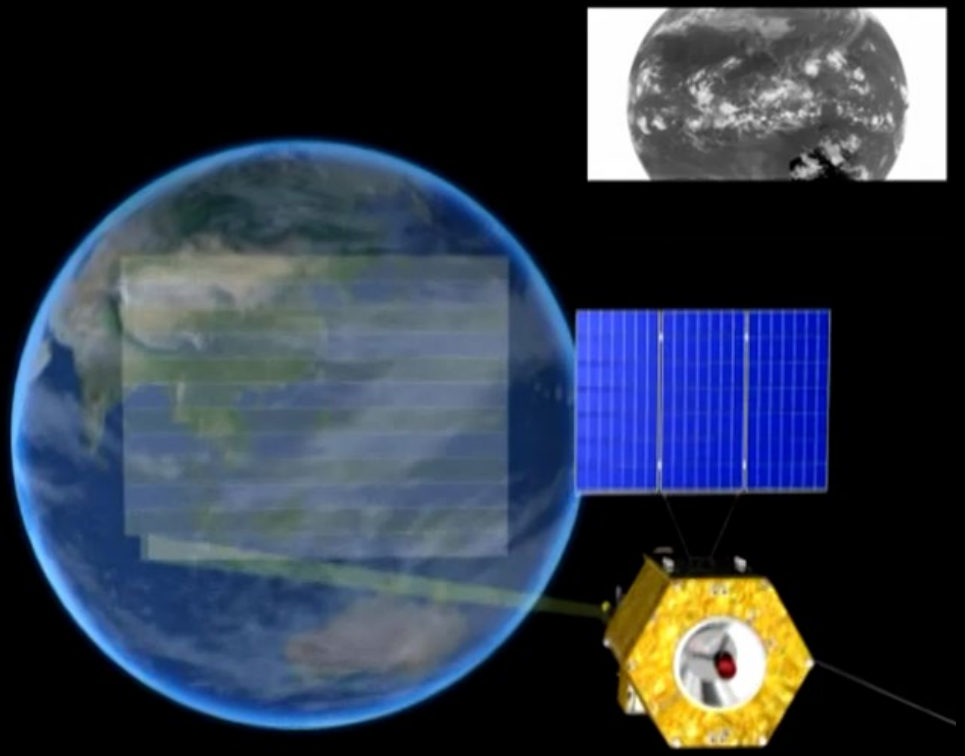


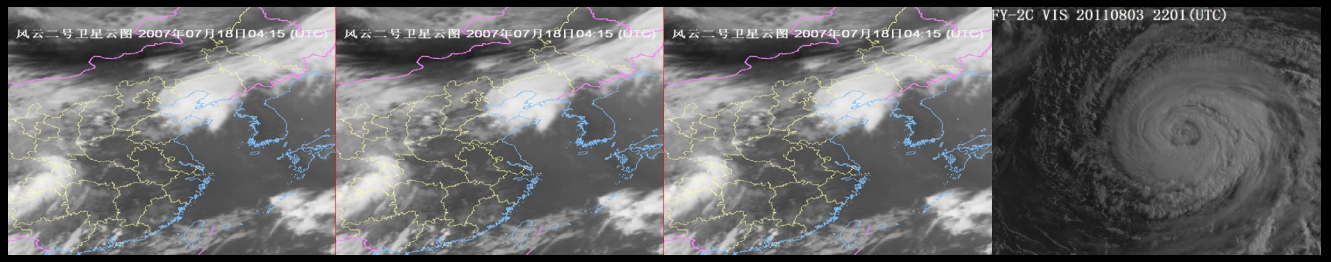
MCS: Mission Control System
DTS: Data and Telemetry System
NRS: Navigation and Registration System
CVS: Calibration and Validation System
PGS: Product Generation System
ADS: Application Demonstration System
SWS: Space Weather System
CNS: Computer and Network System
DSS: Data Distribution and Service System

FY-2/4 Payloads

	FY-4A(EXP)	FY-2(OP)
Stabilization	Three-axis	Spin
Designed Life	5~7 Years	4 Years
Observation efficiency	85%	5%
Observation Mode	Imaging +Sounding + Lightning Mapping	Imaging Only
Main Instruments	AGRI :14 channels SSP Resolution：0.5~4Km Global imaging：15min Flexible imaging ： 2D	VISSR: 5 channels SSP Resolution：1.25~5Km Global imaging：30min Flexible imaging ： 1D
	GIIRS:1650 channels SSP Resolution:16Km Spectral Resolution: 0.625cm-1	N/A
	LMI： SSP Resolution:7.8Km	N/A
	SEP High energy particles Magnetic field	SEM High energy particles Solar X ray fluxes

FY-2/4 Capabilities: Imaging



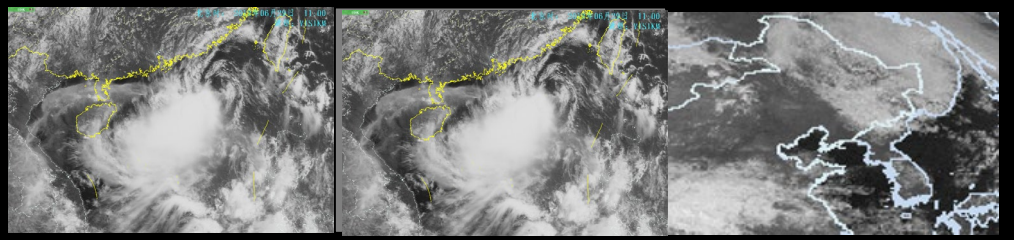


2005 FY-2C
FD 60min

2006 FY-2C
FD 30min

2007 FY-2C+FY-2D
FD 30min
NH 15min

2011 FY-2C
RRS 10 min

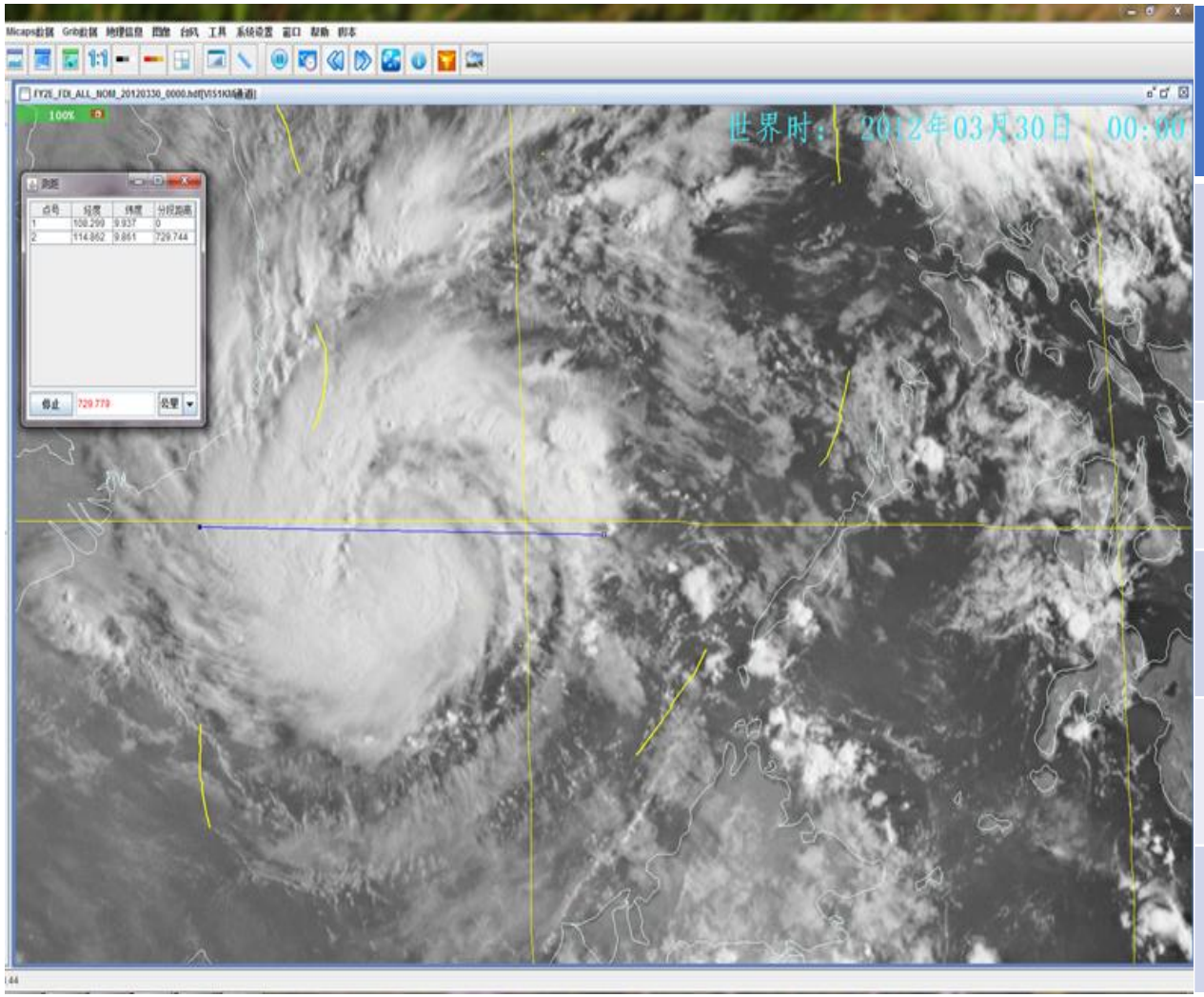


2015 FY-2+FY-4
FD: 15min
RRS: 1-5min

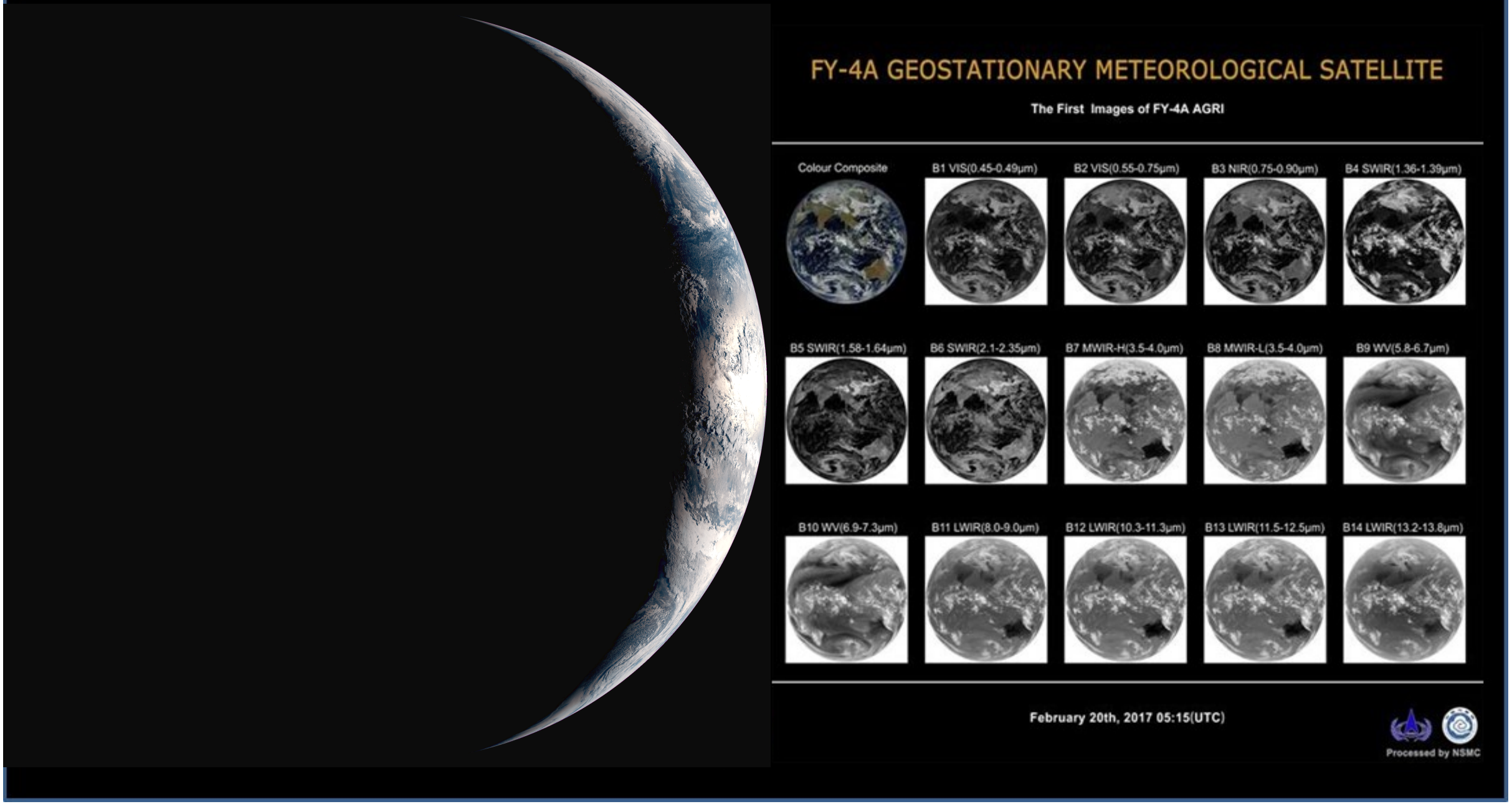
2017 FY-4
FD: 15min
RRS: 5min

2018 FY-2H
FD: 30min
RRS: 6min

Future FY-4B High speed imager (GHI)



ID		Temporal	spatial	NEDT
1	Visible band	2000km × 2000km <1min	0.25km	SNR>4@ρ=1 %
2	1.58-1.64		0.5km	300@ρ=100 %
3	2.1-2.35		0.5km	300@ρ=100 %
4	6.3-7.60		1km	0.2K@300K
5	10.3-11.3		2km	0.2K@300K


FY-4A GEOSTATIONARY METEOROLOGICAL SATELLITE
The First Images of FY-4A AGRI
Colour Composite
B1 VIS(0.45-0.49μm)
B2 VIS(0.55-0.75μm)
B3 NIR(0.75-0.90μm)
B4 SWIR(1.36-1.39μm)
B5 SWIR(1.58-1.64μm)
B6 SWIR(2.1-2.35μm)
B7 MWIR-H(3.5-4.0μm)
B8 MWIR-L(3.5-4.0μm)
B9 WV(5.8-6.7μm)
B10 WV(6.9-7.3μm)
B11 LWIR(8.0-9.0μm)
B12 LWIR(10.3-11.3μm)
B13 LWIR(11.5-12.5μm)
B14 LWIR(13.2-13.8μm)
February 20th, 2017 05:15(UTC)
Processed by NSMC

FY-2/4 Capabilities: Imaging

	FY-2 F/G/H VISSR			FY-4A AGRI			
Channel	**Band**	**Spatial Resolution**	**Sensitivity**	**Band**	**Spatial Resolution**	**Sensitivity**	**Main Application**
Visible & Near-Infrared				0.45～0.49	1	S/N≥90 (ρ=100%)	Aerosol
	0.55～0.75	1.25	2.3 @ρ=1%	0.55～0.75	0.5～1	S/N≥200 (ρ=100%)	Fog, Clound
				0.75～0.90	1	S/N≥5(ρ=1%)@0.5Km	Vegetation
Short-wave Infrared				1.36～1.39	2	S/N≥200 (ρ=100%)	Cirrus
				1.58～1.64	2	S/N≥200 (ρ=100%)	Cloud,Snow
				2.1～2.35	2～4		Cirrus,Aerosol
Mid-wave Infrared				3.5～4.0(High)	2	NEΔT≤0.7K(300K)	Fire
	3.5～4.0	5	0.22K@300K	3.5～4.0(Low) *	4	NEΔT≤0.2K(300K)	Land surface
Water Vapor				5.8～6.7	4	NEΔT≤0.3K(260K)	WV
	6.3～7.6	5	0.30K@260K	6.9～7.3	4	NEΔT≤0.3K(260K)	WV
Long-wave Infrared				8.0～9.0*	4	NEΔT≤0.2K(300K)	WV,Cloud
	10.3～11.3	5	0.12K@300K	10.3～11.3*	4	NEΔT≤0.2K(300K)	SST
	11.5～12.5	5	0.16K@300K	11.5～12.5*	4	NEΔT≤0.2K(300K)	SST
				13.2～13.8*	4	NEΔT≤0.5K(300K)	CTH

Evolution of FY-4 AGRI imager:

◆More Channels FY-4A(14), FY-4B(15),FY-4C(18）

◆Spatial resolution 2km (FY-4C)

◆Full disk observation time 5min(FY-4C)

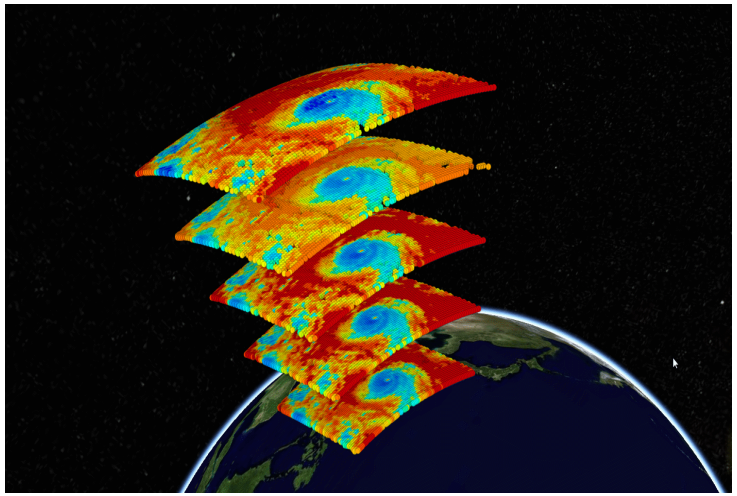
			FY-4		
序号	GOES-R	MTG	Channel	Resolution	SNR/NEDT
12	*6.185±0.415*	6.3±0.20	5.8-6.7	4km	0.2k@300k
13	*6.95±0.2*		6.75-7.15	4km	0.25k@300k
14	*7.34±0.1*	7.35±0.25	*7.24-7.6*		
15	*8.5±0.2*	8.7±0.15	8.4-9.0	4km	0.2k@300k
16	*9.61±0.19*	9.66±0.15	*9.42-9.80*		

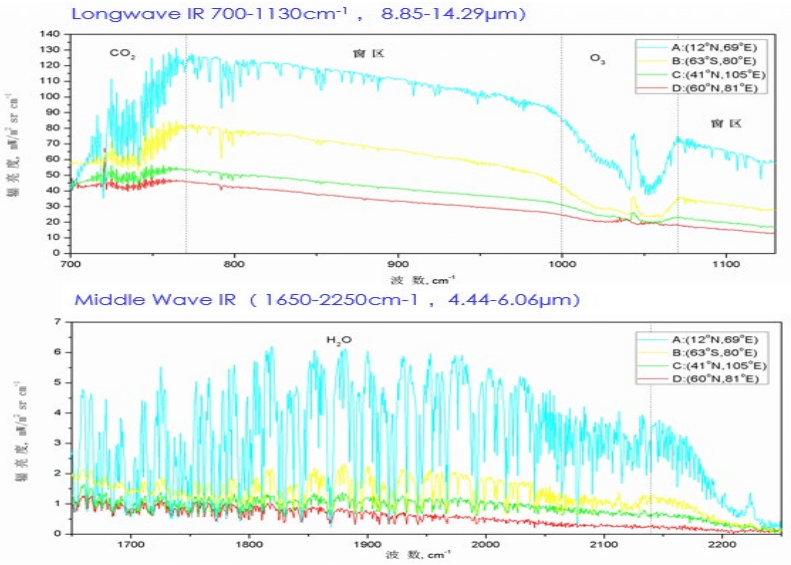
1. 7.34μm→low level watervapor,SO2
2. 9.61μm→high level information ,O3
3. 0.525μm、0.65μm→true color

通道	空间分辨率	
	FY-4(B) (C)	
0.47±0.02	1km	0.5km
0.525±0.025		0.5km
0.65±0.1	0.5-1	0.5km
0.65±0.02	0.5~1	0.5km
0.825±0.075	1km	1km
1.375±0.015	2km	1km
1.61±0.03	2km	1km
2.225±0.125	2~4	1km
3.725±0.025H	2km	1km
3.725±0.025L	4km	2km
6.25±0.45	4km	2km
7.1±0.2**	4km	2km
8.5±0.5	4km	2km
9.61±0.19*		2km
10.8±0.5	4km	2km
12.0±0.5	4km	2km
13.5±0.3	4km	4km

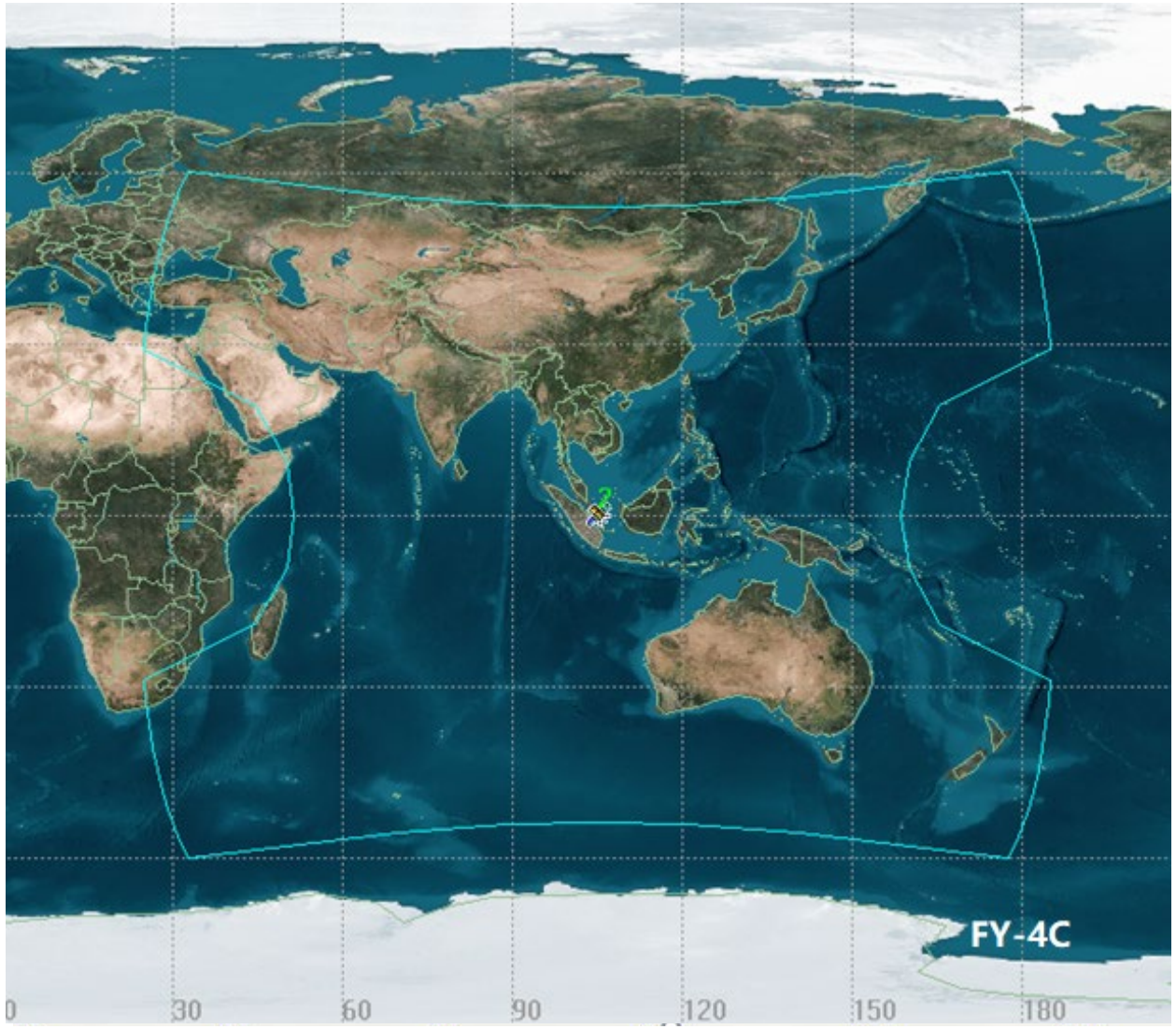
FY-4 Capabilities : Hyperspectral Sounding

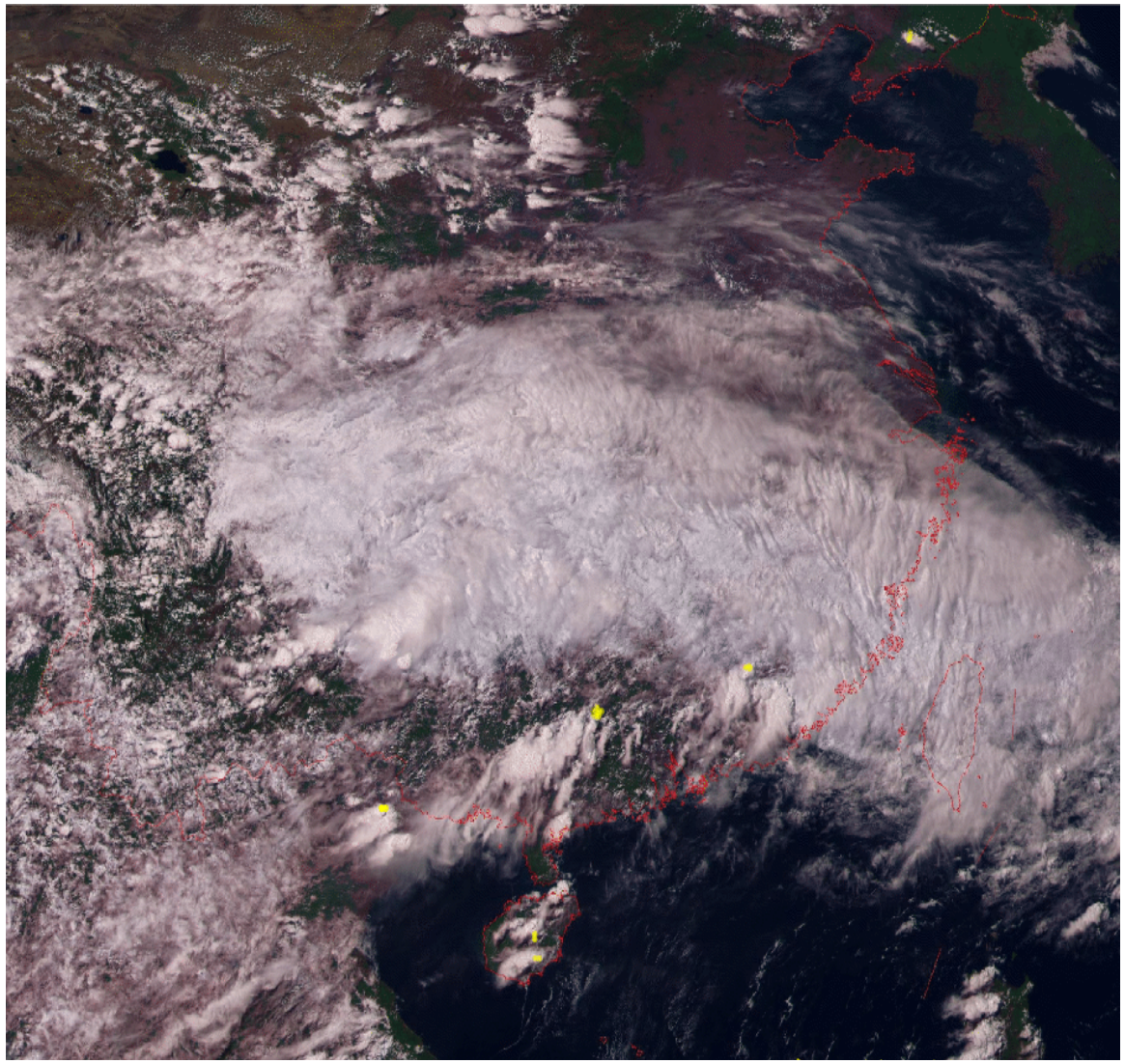
	FY-4A GIIRS	FY-4B GIIRS	FY-4C GIIRS
Spectral range (cm^{-1})	700 – 1130	680 – 1130	650 – 1130
	1650 –2250	1650 –2250	1650 –2250
Spectral resolution (cm^{-1})	0.625	0.625	0.625
	0.625	0.625	0.625
Sensitivity@280K (K)	0.4-0.8	0.4	0.2
	0.8-1.2	0.8	0.1
Spatial resolution (Km)	16	12-16	8
Temporal resolution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





FY-4 Capabilities: Lightning monitoring

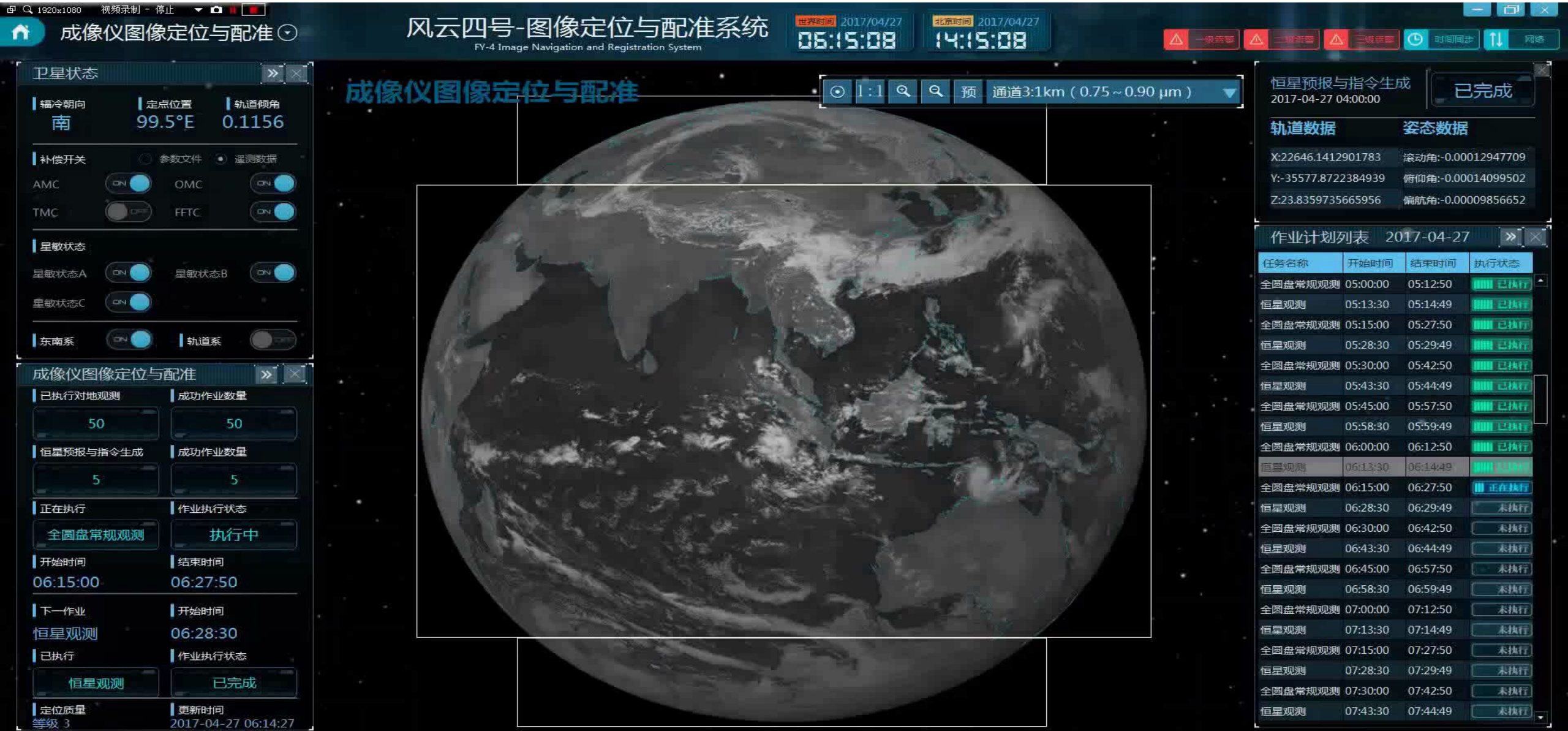




FengYun GEO Satellites Launch Plan by 2025

ID	Orbit	Status	Launch
FY-4B	Geo	Op, planed	2020
FY-4C	Geo	Op, planed	2022
FY-4MW	Geo	Op, planed	TBD
FY-4D	Geo	R&D, Planed	TBD

FengYun Geostationary satellite Products



FY-2/4 L1 Products quality

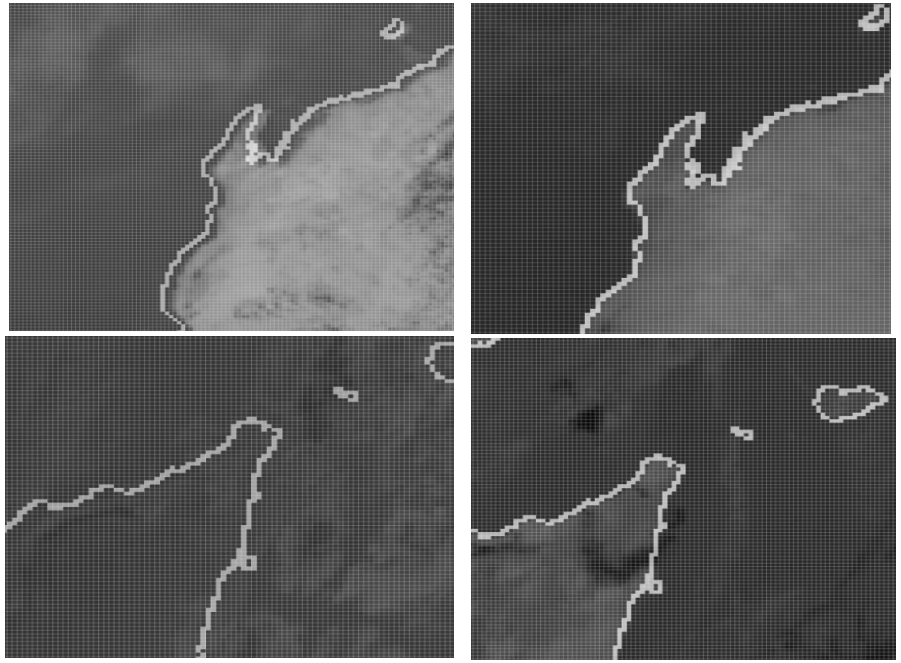
Three major updates for AGRI since 2017:

① Optimal star selection strategy: visible stars & infrared stars (2018)
② Updated thermal deformation model (2018)
③ Channel-to-channel registration parameter update (2017, 2019)

Two major updates for LMI since 2017

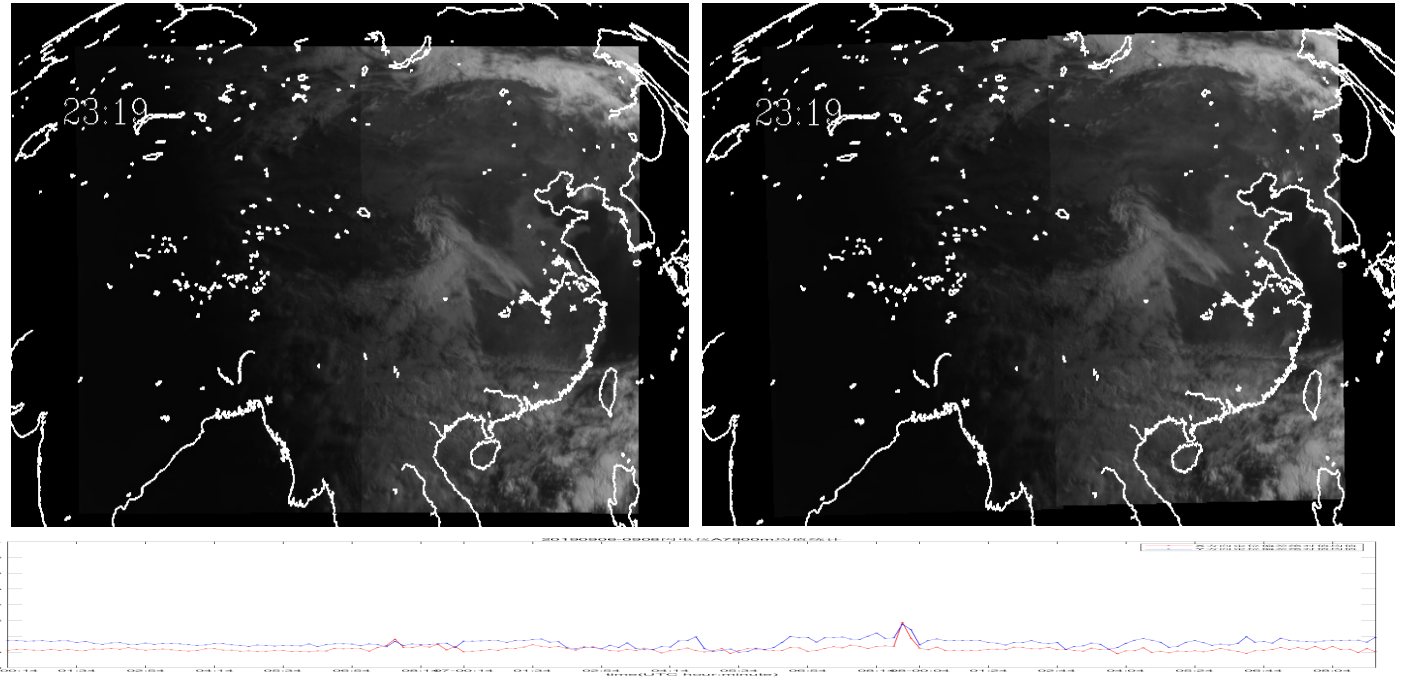
① Thermal alignment correction in the night using the temperature of LMI panel (2017)
② Navigation correction using the mixed part of two mirrors (2017)

2016INR 20169INR



FY-4A/AGRI Navigation accuracy:
Within 1 IR pixel (2.95 km, 3sigma)@all day

2017 LMI INR 2018 LMI INR



FY-4A/LMI Navigation accuracy:
Wihtin 1 pixels （7.8km 3sigma)

Courtesy of Dr.Lei Yang CMA/NSMC

FY-2/4 L1 Products quality

FY-4A/GIIRS Navigation accuracy: Within 0.5 IR pixel

Two major updates for GIIRS since 2017:

① Intelligent observation instruction parameter generation (2018)

② Instruction solution of PCLK event (2019)

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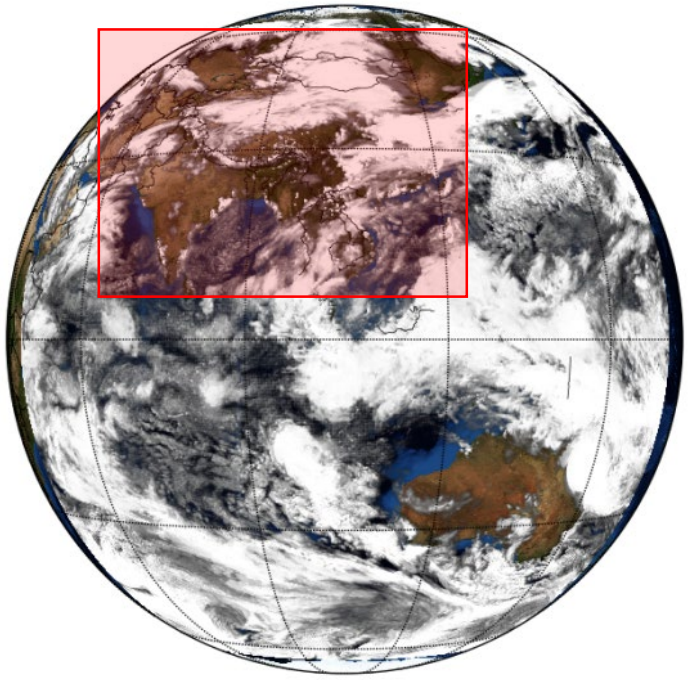
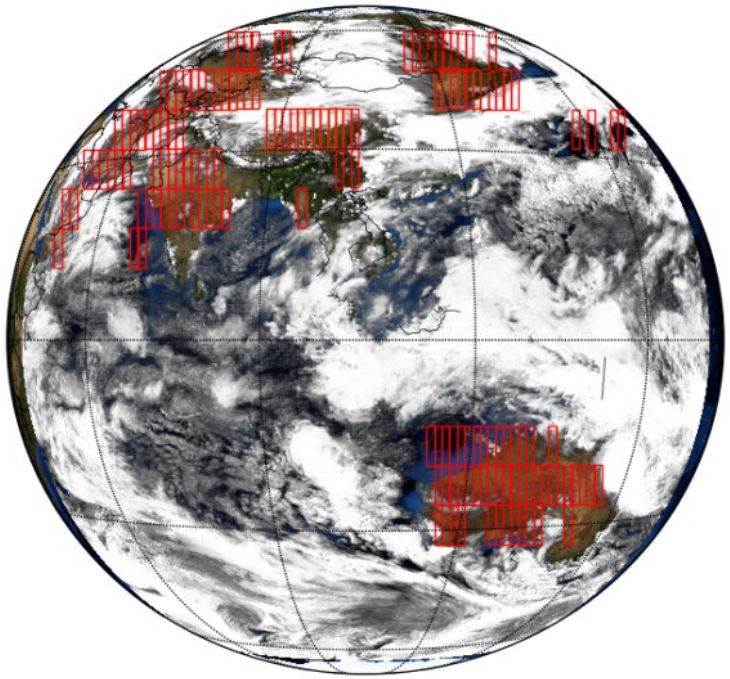
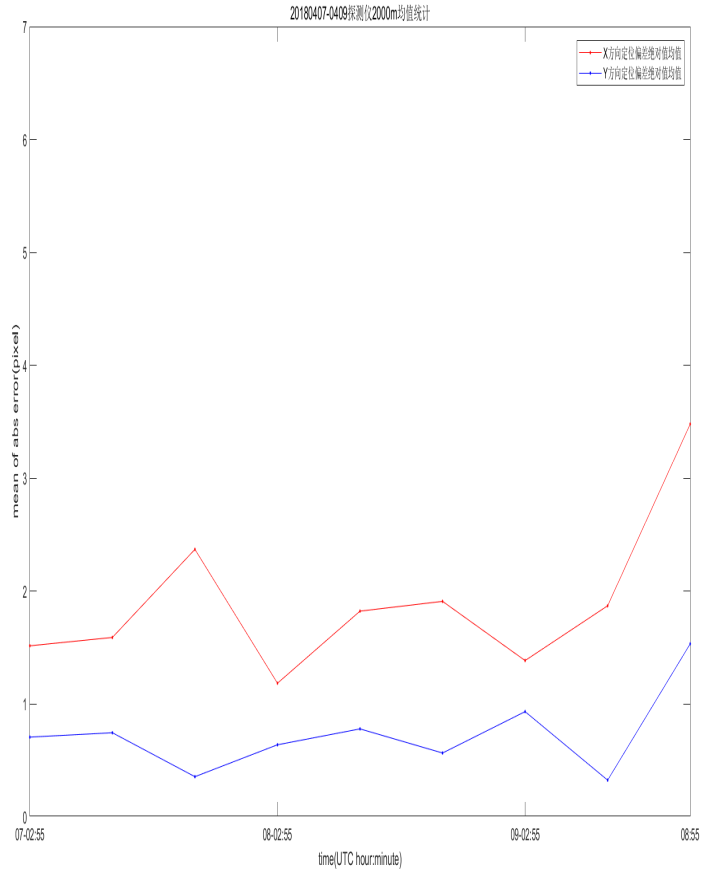


2017: China Region



2018: User Driven

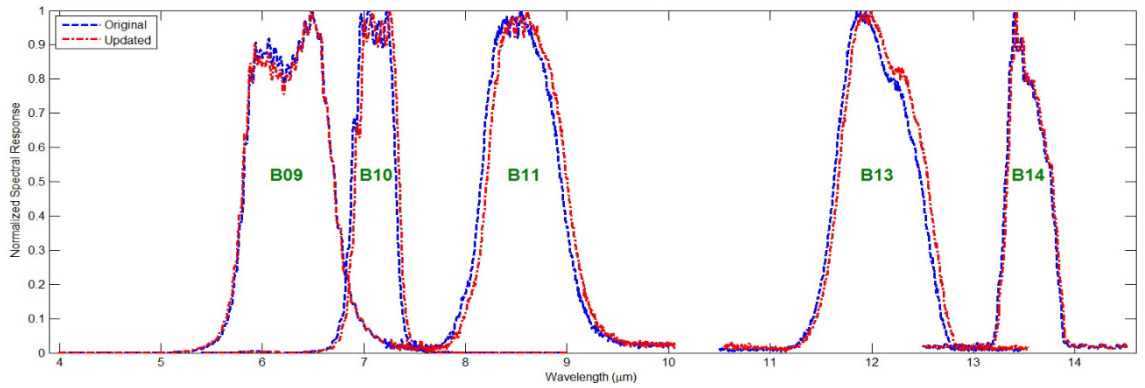


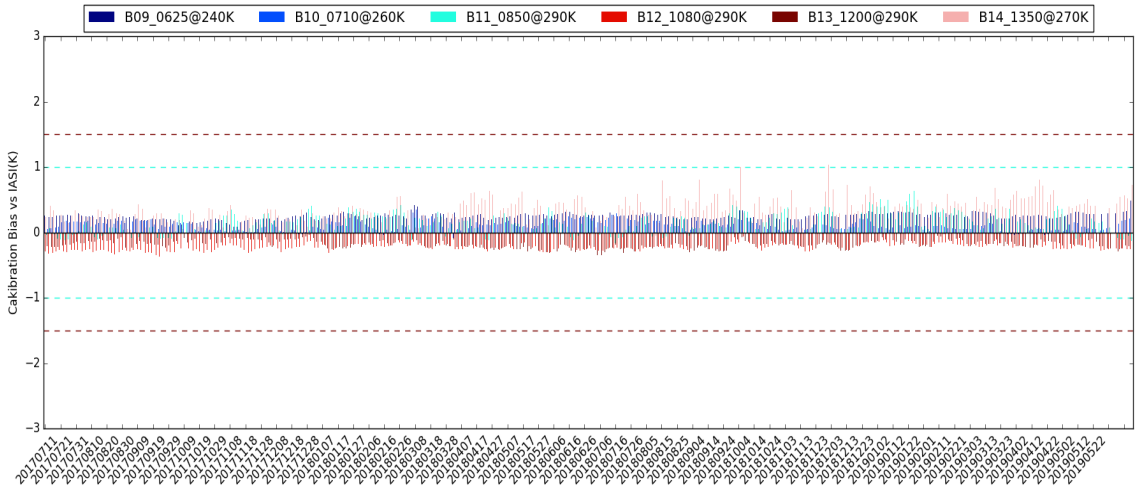
Courtesy of Dr.Lei Yang CMA/NSMC

FY-2/4 L1 Products quality

8 November 2019 ,GIIRS calibration update to V3

8 November 2019 ,AGRI calibration update

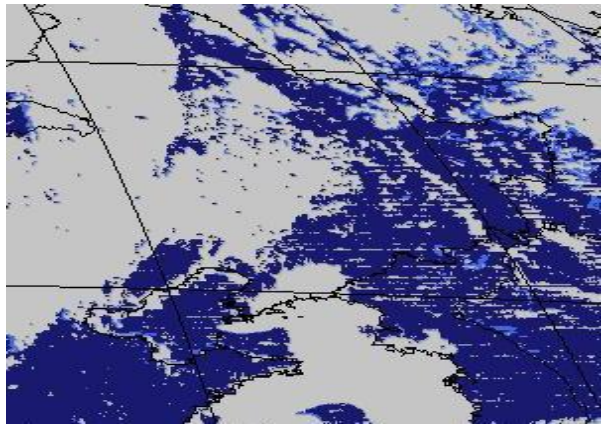




FY-4A/AGRI IR channel calibration accuracy:

0.3K~0.5K@290K

Before de-stripe



After 2019 de-stripe

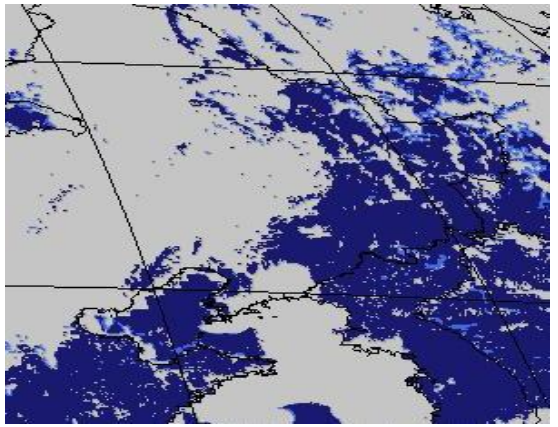


Table 1 Update times and correction coefficients of FY-4A/AGRI reflective solar bands

Band / Update time	1	2	3	4	5	6
2017.06.09	1.1615	1.1435	1.2002	1	1.1112	0.90593
2018.03.15	1.2813	1.1435	1.2002	0.5907	1.1687	0.90593
2018.12.29	1.6	1.1435	1.0609	0.5907	1.1269	0.90593
2019.09.25	1.7	1.1435	1.0609	0.5907	1.1269	0.90593

Courtesy of Dr.Boyang Chen and Lin Sun CMA/NSMC

FY-2/4 L1 Products

Product ▲	Satellite	Instrument	Period	Format	Resolution
Compressed full disk VISSR data	FY2F	VISSR	HHmm	CSV	Full Resolution
Compressed full disk VISSR data	FY2H	VISSR	HHmm	CSV	Full Resolution
Compressed full disk VISSR data	FY2G	VISSR	HHmm	CSV	Full Resolution
Normalized Geostationary Projection VISSR data	FY2F	VISSR	HHmm	HDF	Full Resolution
Normalized Geostationary Projection VISSR data	FY2G	VISSR	HHmm	HDF	Full Resolution
Normalized Geostationary Projection VISSR data	FY2H	VISSR	HHmm	HDF	Full Resolution

http://satellite.nsmc.org.cn/portalsite/Data/DataView.aspx

Product ▲	Satellite	Instrument	Period	Format	Resolution
AGRI L1 China Regional, 1KM	FY4A	AGRI	HHmm	HDF	1000M
AGRI L1 China Regional, 2KM	FY4A	AGRI	HHmm	HDF	2000M
AGRI L1 China Regional, 4KM	FY4A	AGRI	HHmm	HDF	4000M
AGRI L1 China Regional, 500M	FY4A	AGRI	HHmm	HDF	500M
AGRI L1 China Regional, GEO	FY4A	AGRI	HHmm	HDF	4000M
AGRI L1 Full Disk, 1KM	FY4A	AGRI	HHmm	HDF	1000M
AGRI L1 Full Disk, 2KM	FY4A	AGRI	HHmm	HDF	2000M
AGRI L1 Full Disk, 4KM	FY4A	AGRI	HHmm	HDF	4000M
AGRI L1 Full Disk, 500M	FY4A	AGRI	HHmm	HDF	500M
AGRI L1 Full Disk, GEO	FY4A	AGRI	HHmm	HDF	4000M
GIIRS L1 Infrared, Regional	FY4A	GIIRS	HHmm	HDF	16KM

FengYun Geo L2 Products

FY-2 C/D/E operational L2 products`	FY-2 F/G/H operational L2 products	FY-4A Operational L2 products
Cloud Detection	Cloud Detection	Clear Sky Masks (CLM)
Cloud Classification	Cloud Classification	Cloud Type(CLT)
Total Cloud Amount	Total Cloud Amount	
		Cloud Phase
	Cloud Top Temperature	Cloud Top Temperature
		Cloud Top Height/Pressure
		Fog Detection
Dust Detection	Dust Detection	Dust Detection
		Aerosol Optical Depth
Humidity product	Humidity product	Liquid Profile Water
		Atmospheric temperature profile
		Tropopause folding
		Convective initiation

FengYun Geo L2 Products

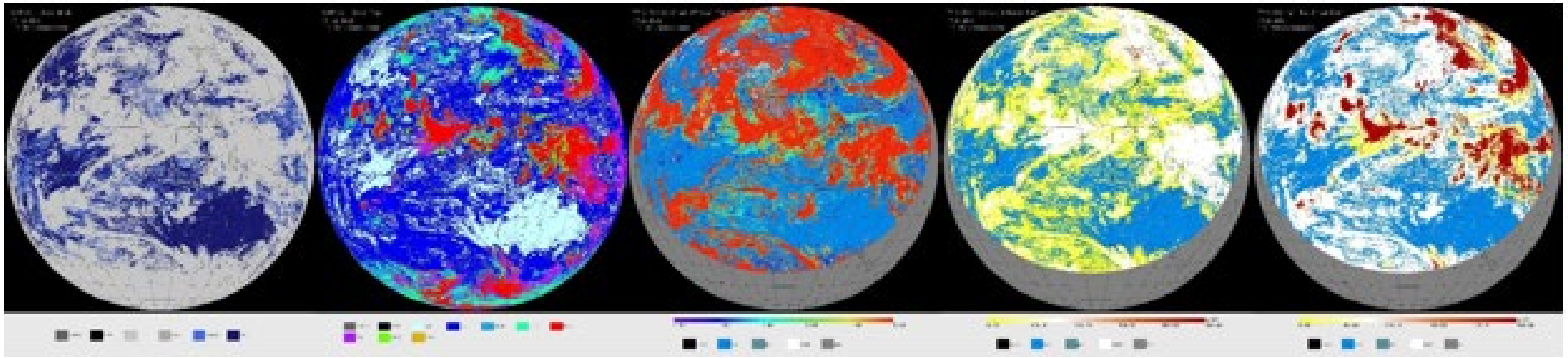
FY-2 C/D/E operational L2 products	FY-2 F/G/H operational L2 products	FY-4A Operational L2 products
Upper Tropospheric Humidity	Upper Tropospheric Humidity	Atmospheric Correction Image
Precipitation Estimation	Precipitation Estimation	Rainfall Rate(QPE)
	Atmospheric Motion Vector	Atmospheric Motion Vector
		Lightning Detection
Surface Solar Irradiance	Surface Solar Irradiance	Surface Solar Irradiance
Blackbody brightness temperature	Blackbody brightness temperature	
Outgoing Long wave Radiation	Outgoing Long wave Radiation	Outgoing Long wave Radiation
		Downward Long wave Radiation: Surface
		Upward Long wave Radiation: Surface
		Reflected Shortwave Radiation: TOA
	Land Surface Temperature	Land Surface Temperature(LST)
Sea Surface Temperature	Sea Surface Temperature	Sea Surface Temperature (SST)
		Land Surface Emissivity（LSE)
Snow Cover	Snow Cover	
		Fire/Hot Spot Characterization

FY-4A L2 Product details

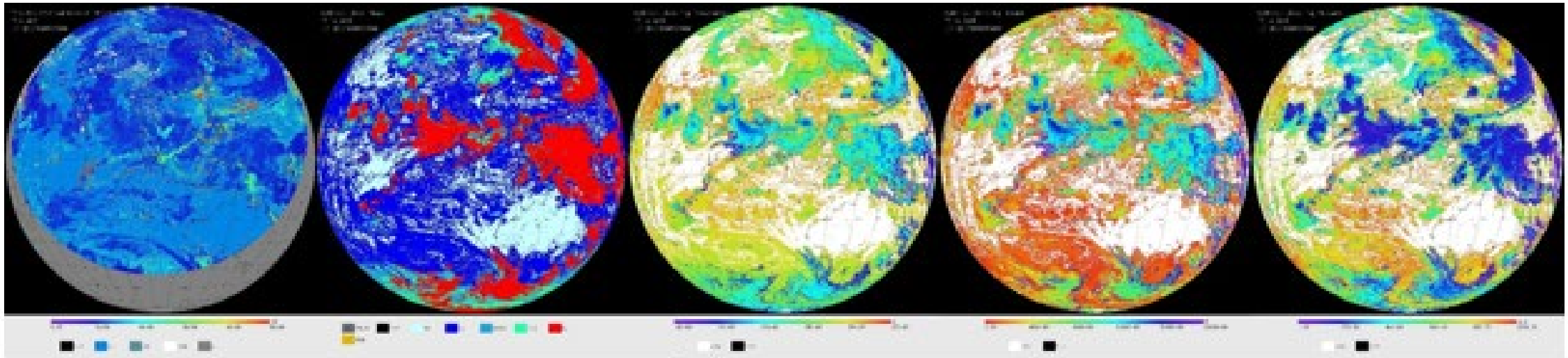
Product	Instrument	Format	Resolution
Atmosphere Instability Index, Disk	GIIRS	NC	16KM
Atmospheric Correction Image	AGRI	NC	1000M
Atmospheric Motion Vector, High Level	AGRI	NC	64KM
Atmospheric Motion Vector, Infrared	AGRI	NC	64KM
Atmospheric Motion Vector, Low Level	AGRI	NC	64KM
Cloud Mask	AGRI	NC	4000M
Cloud Phase	AGRI	NC	4000M
Cloud Top Height	AGRI	NC	4000M
Cloud Top Pressure	AGRI	NC	4000M
Cloud Top Temperature	AGRI	NC	4000M
Cloud Type	AGRI	NC	4000M
Convection Index	AGRI	NC	4000M
Downgoing Longwave Radiation	AGRI	NC	4000M

Product	Instrument	Format	Resolution
Fire Hot Spot Detection	AGRI	NC	2000M
Fog Detection, Full Disk	AGRI	NC	4000M
Land Surface Emissivity	AGRI	NC	12KM
Land Surface Temperature	AGRI	NC	4000M
Liquid Percentage Water	AGRI	NC	4000M
Outgoing Longwave Radiation	AGRI	NC	4000M
Quantitative Precipitation Estimation, Northern Hemisphere	AGRI	NC	4000M
Reflective Shortwave Radiation	AGRI	NC	4000M
Sea Surface Temperature	AGRI	NC	4000M
Surface Solar Incidence Radiation	AGRI	NC	4000M
Tropopause Folding	AGRI	NC	4000M
Upgoing Longwave Radiation	AGRI	NC	4000M

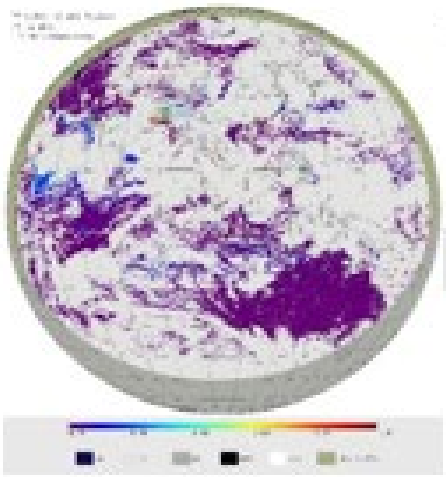
http://satellite.nsmc.org.cn/portalsite/Data/DataView.aspx



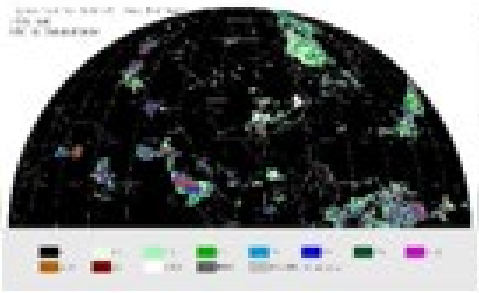
Clear Sky Masks | Cloud Type | Cloud Optical Depth | Cloud Liquid Water Path | Cloud Ice Water Path



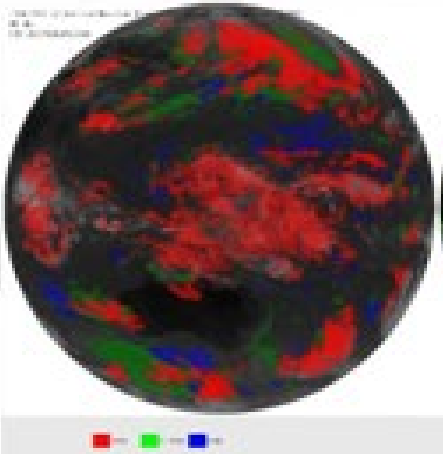
Cloud Particle Size Distribution | Cloud Phase | Cloud Top Temperature | Cloud Top Height | Cloud Top Pressure



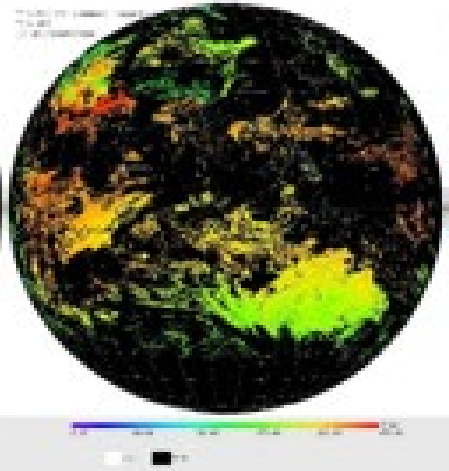
Aerosol Detection



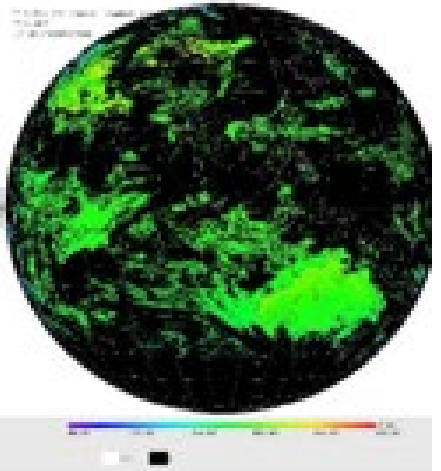
Rainfall Rate/QPE



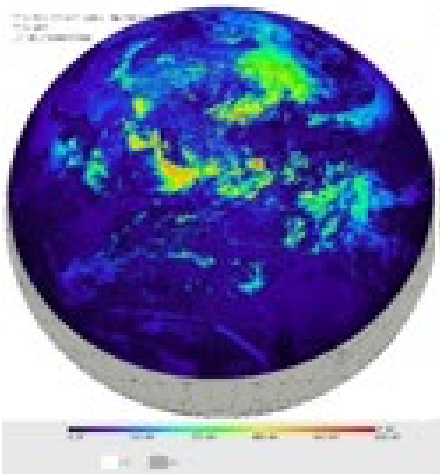
Atmospheric Motion Vector



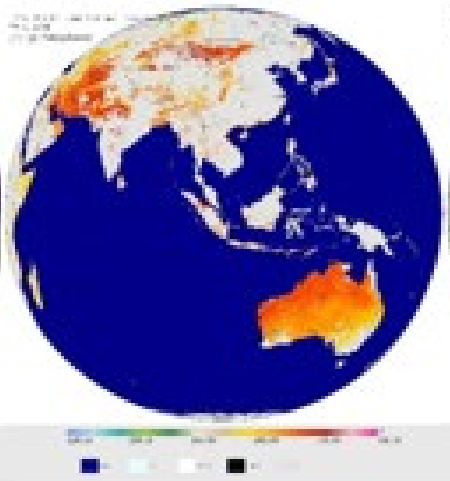
Downward Long wave Radiation:Surface



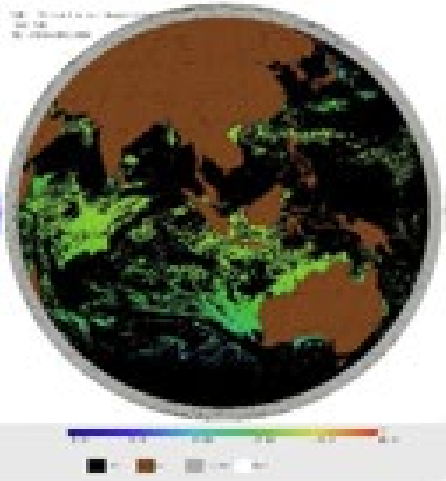
Upward Long wave Radiation: Surface



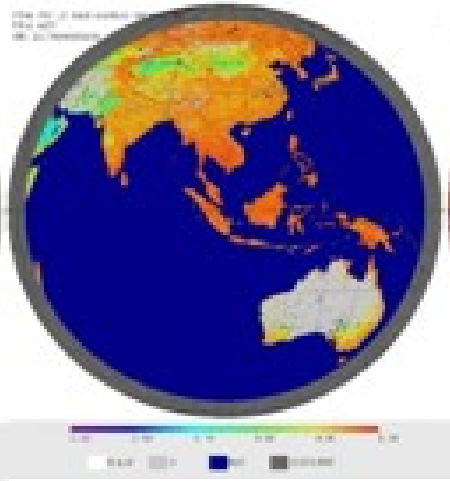
Reflected Shortwave Radiation



Land Surface (Skin) Temperature



Sea Surface (Skin) Temperature

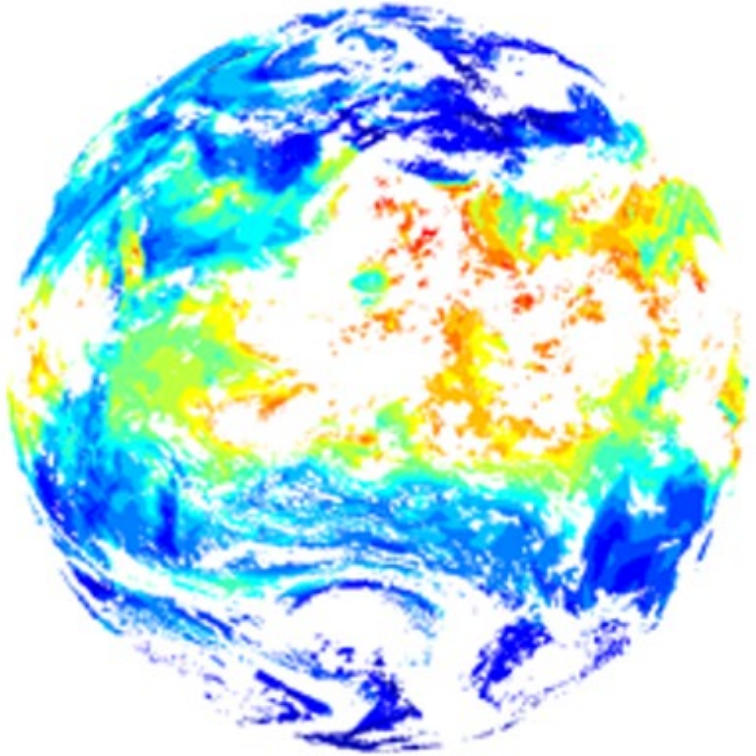


Land Surface Emissivity

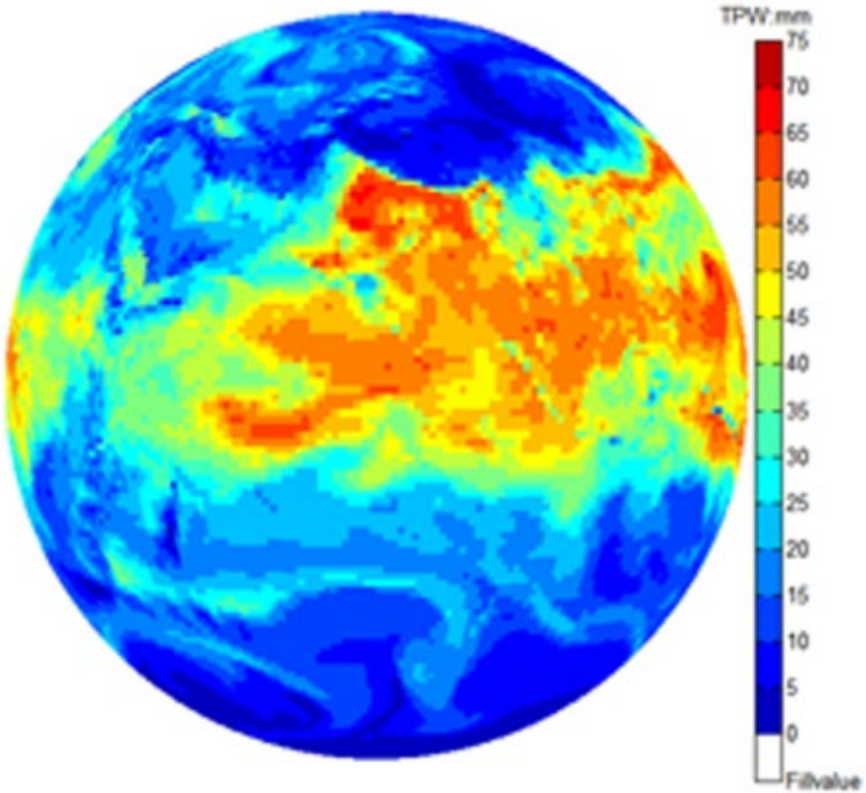
Land Surface Emissivity

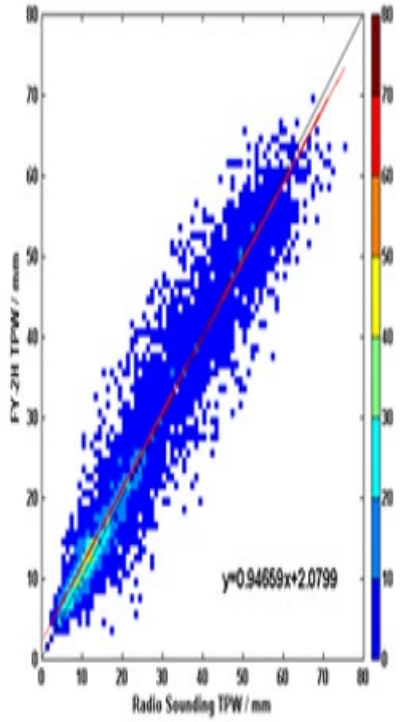
FY-2H TPW Products

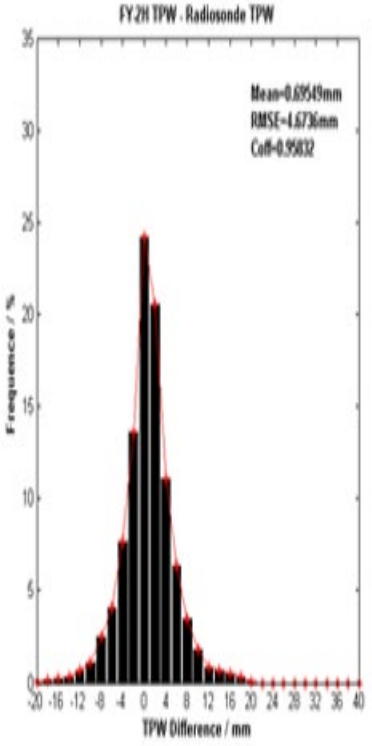
FY-2H 20180922 00:00



NCEP FNL 20190922 00:00





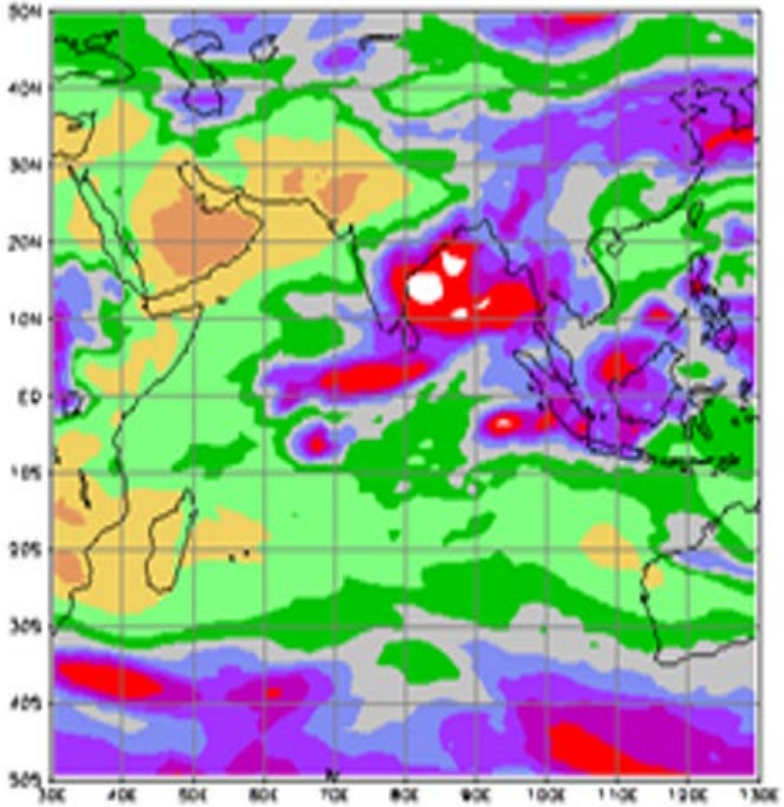


Bias=0.695
RMSE=4.67
CORR=0.95

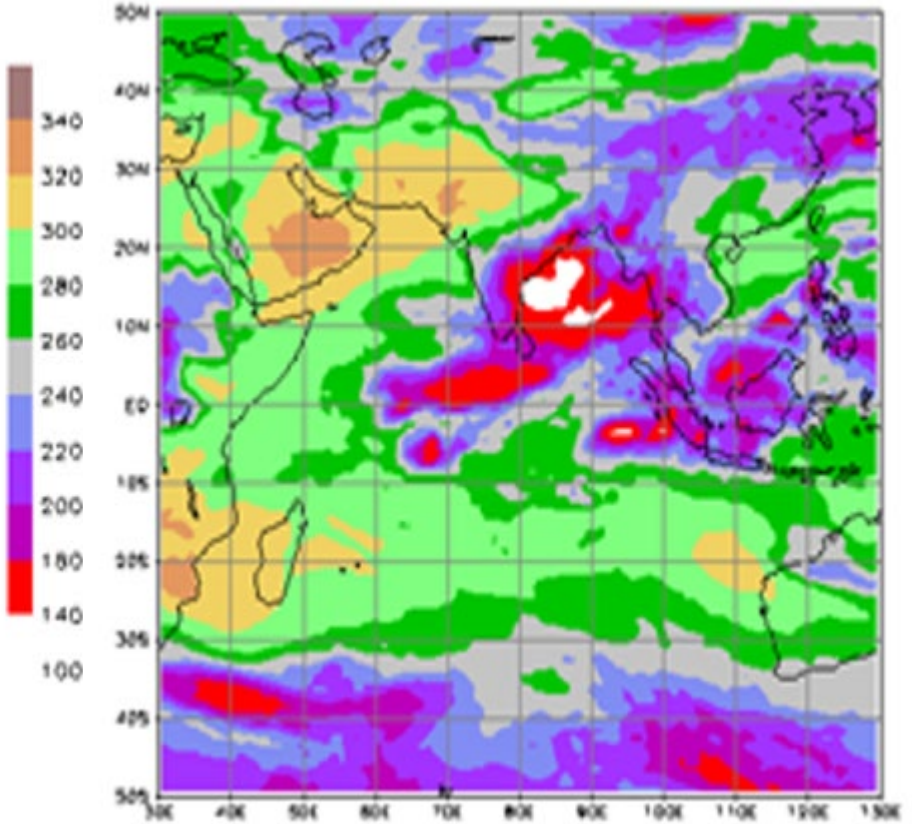
Courtesy of Dr.Ran YouCMA/NSMC

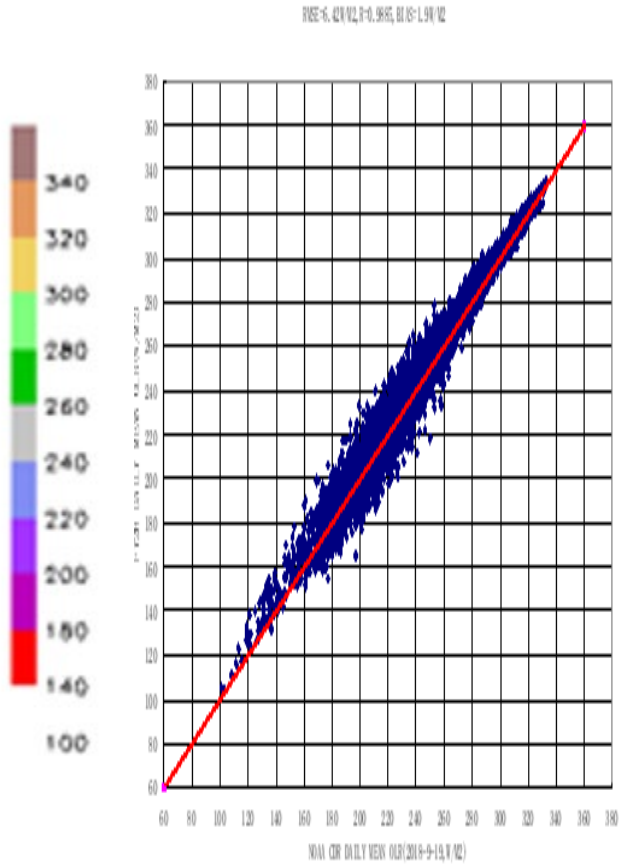
FY-2H OLR Products

FY-2H OLR 2018-9-19



NOAA CDR OLR 2018-9-19

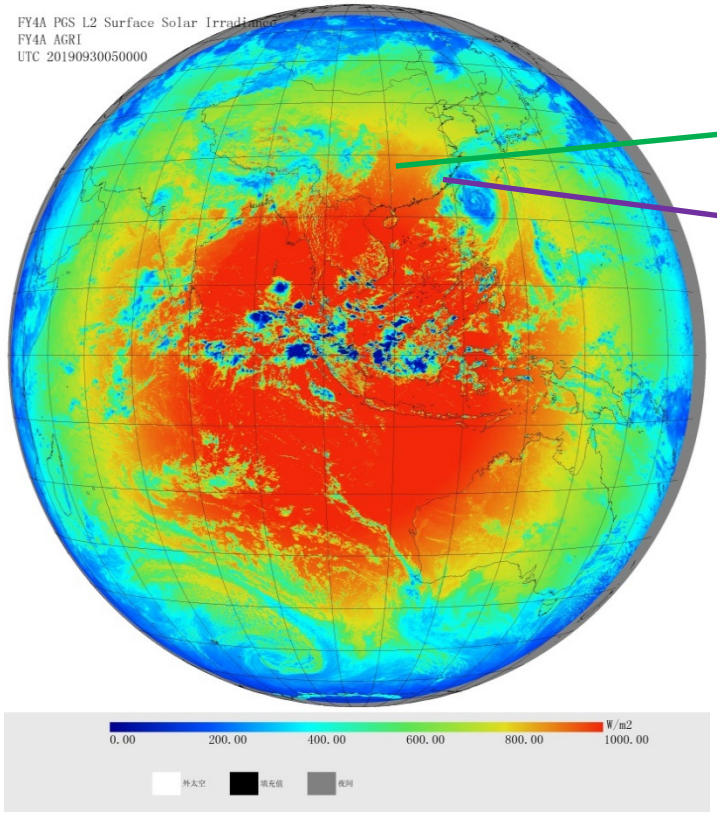




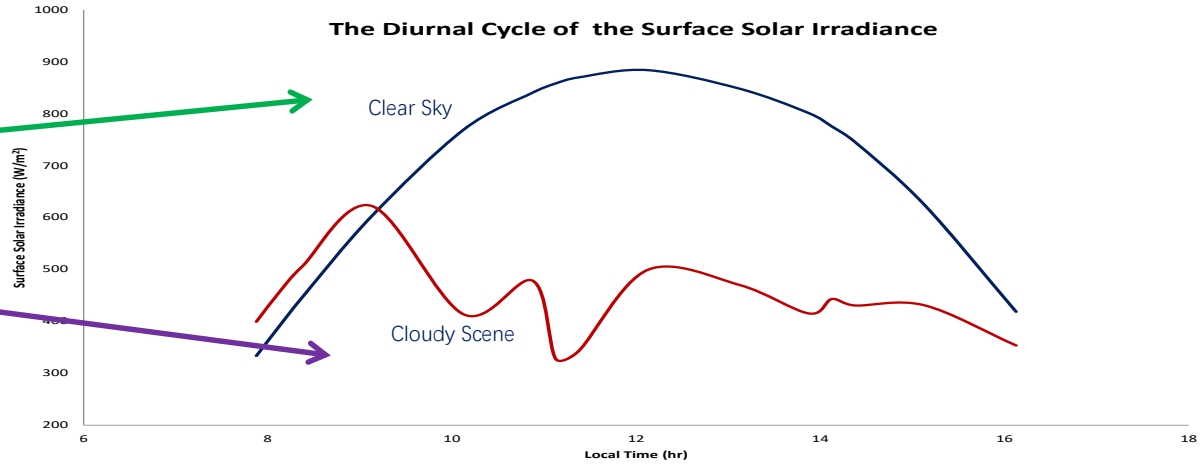
RMSE=3-6w/m^2

Courtesy of Dr.Xiao Wu CMA/NSMC

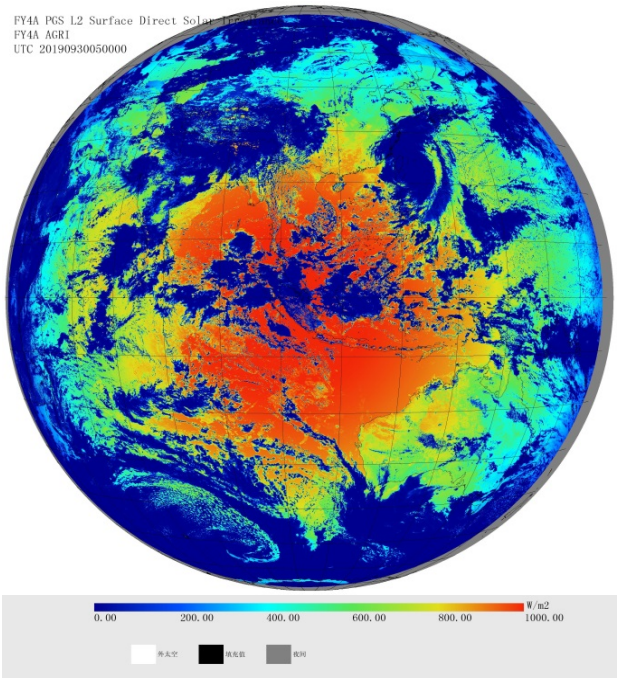
FY-4A Surface Solar Irradiance (SSI) products



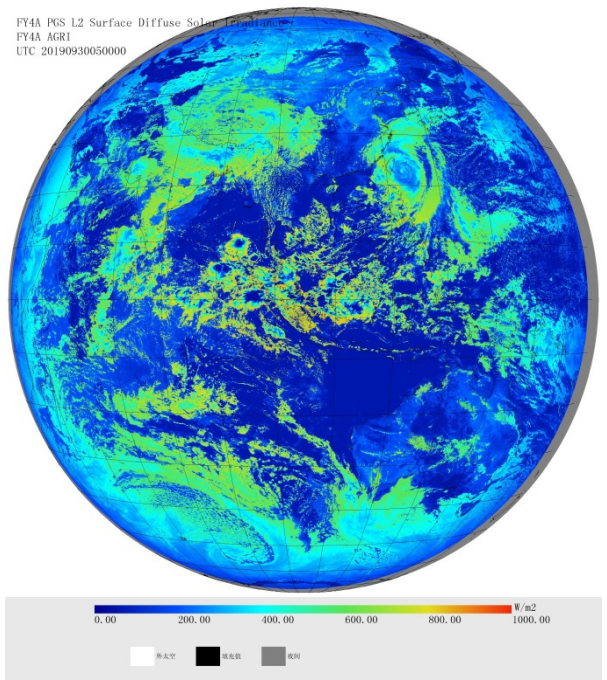
Surface Solar Irradiance (W/m^2)



FY-4A SSI products derive the total solar irradiance (flux) received at the Earth's surface over a nominal spectral range 0.2-5.0μm, including both direct and diffuse components.



Direct Solar Irradiance (W/m^2)

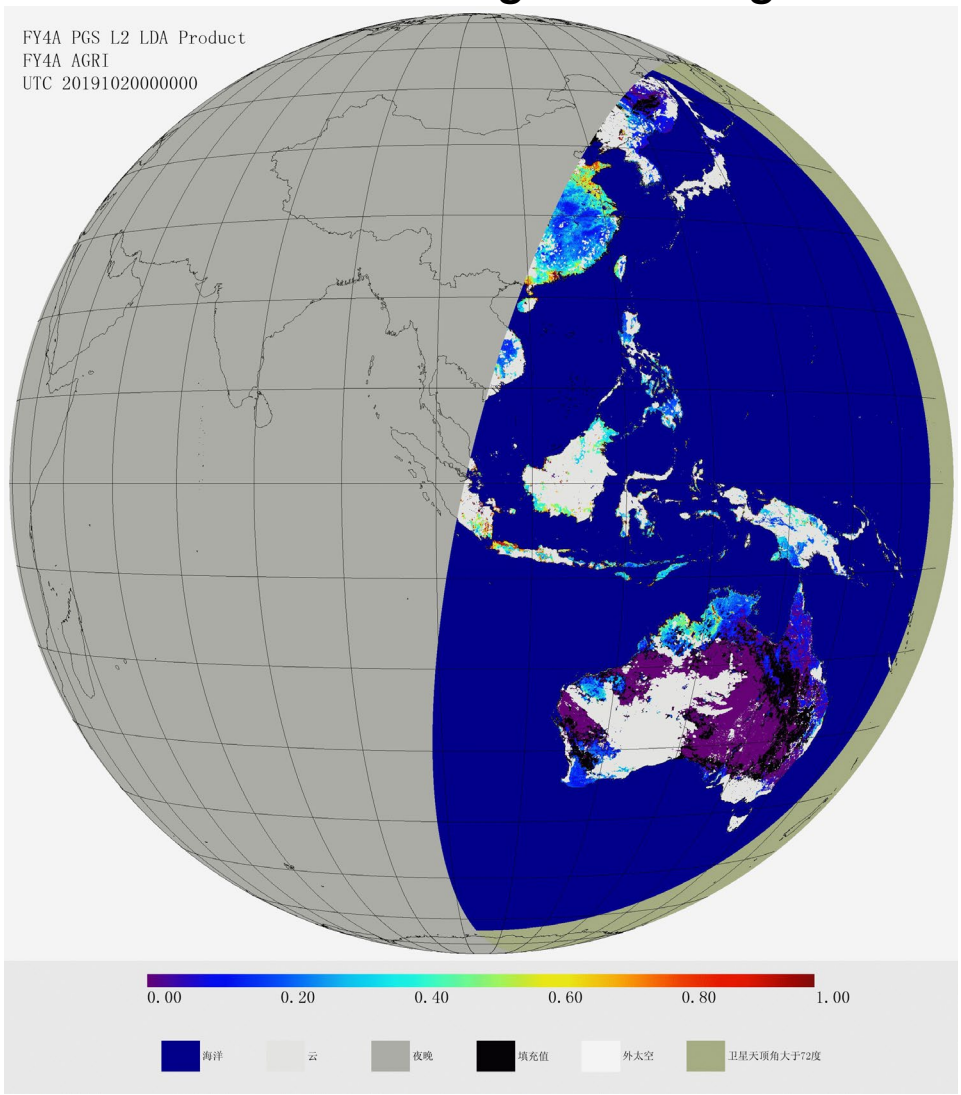


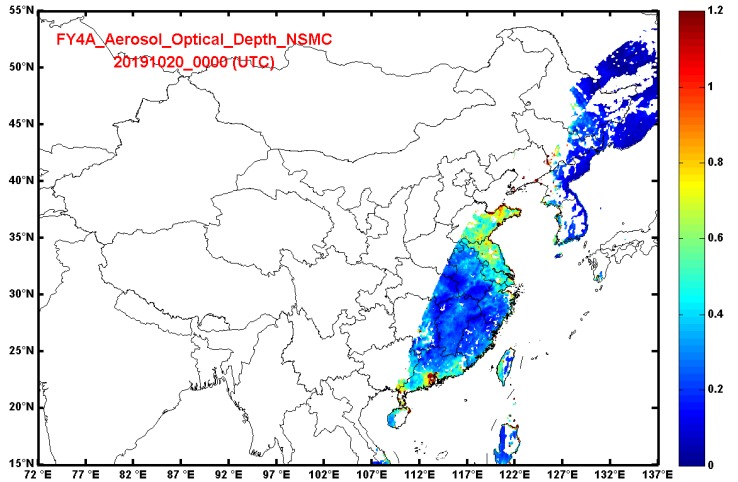
Diffuse Solar Irradiance (W/m^2)

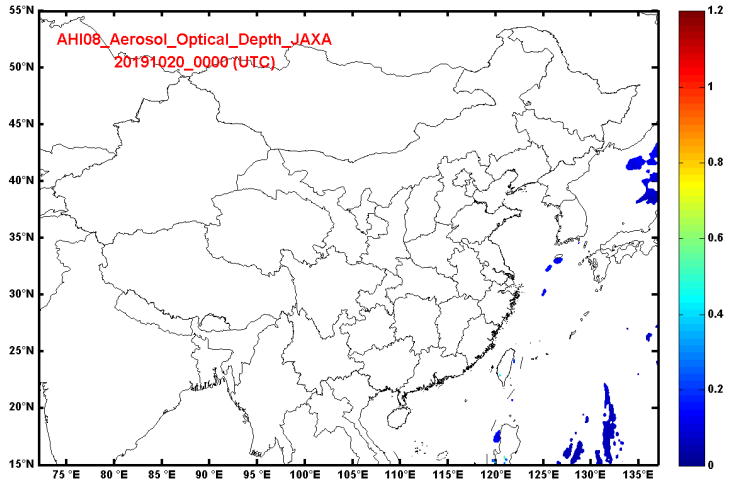
Courtesy of Dr.Liqing Hu CMA/NSMC

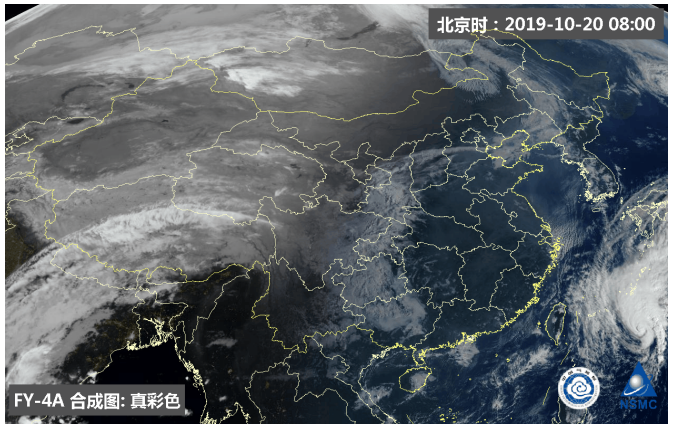
FY-4A AOD products

The increase of spectral bands in the VIS/NIR wavelength range makes the high quality aerosol retrieval over land from the new generation geostationary satellites possible









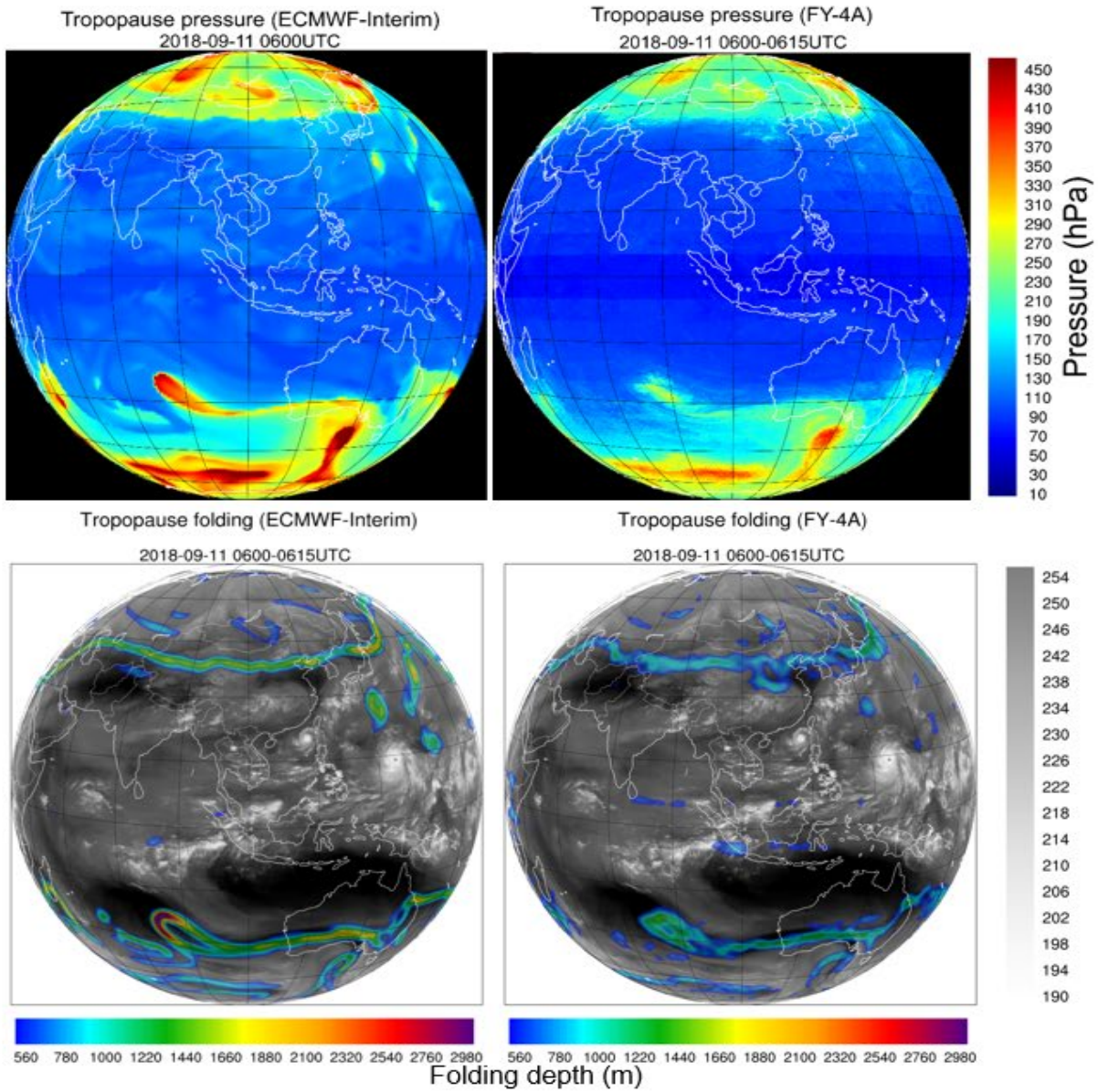
Region: Fulldisk coverage

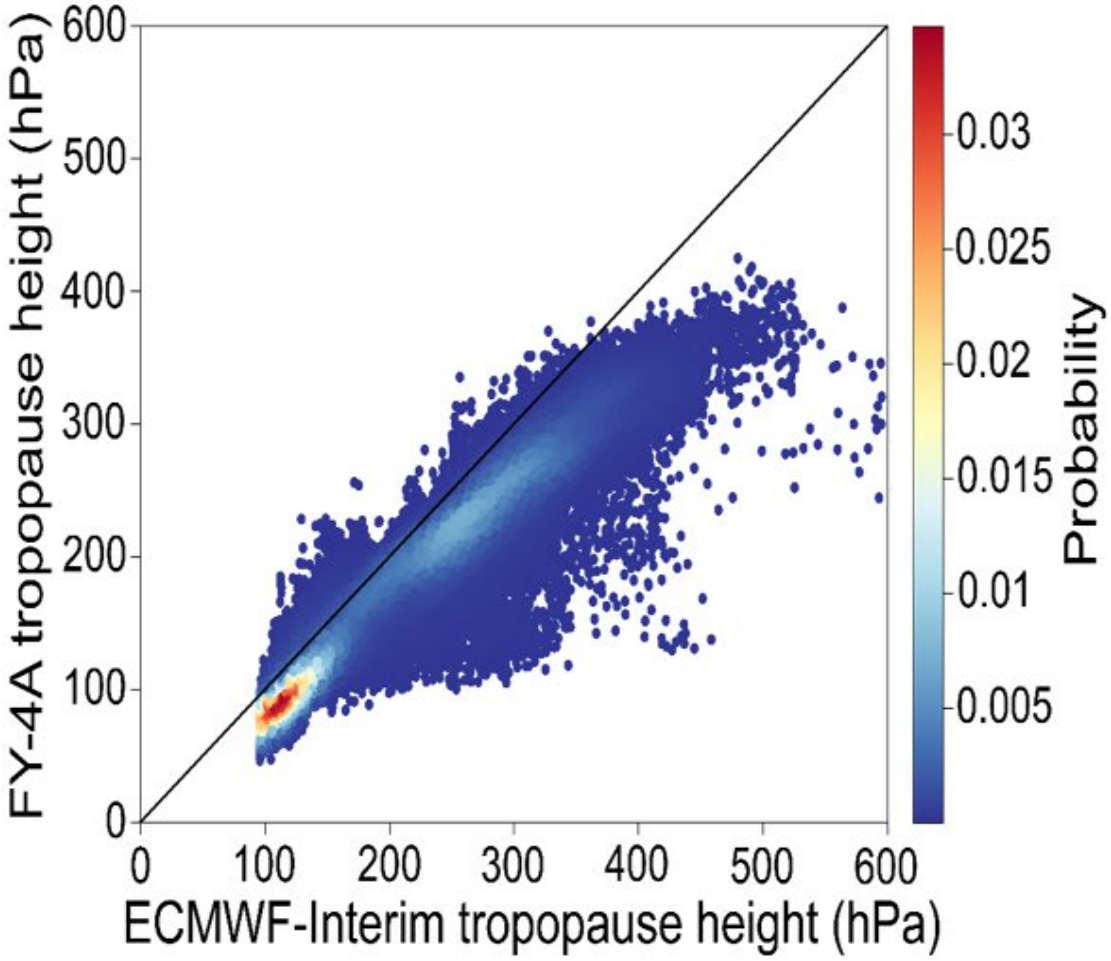
Spatial resolution: 4km

Temporal resolution: 1 hour

Courtesy of Dr.Ling Gao CMA/NSMC

FY-4A TFTP Products

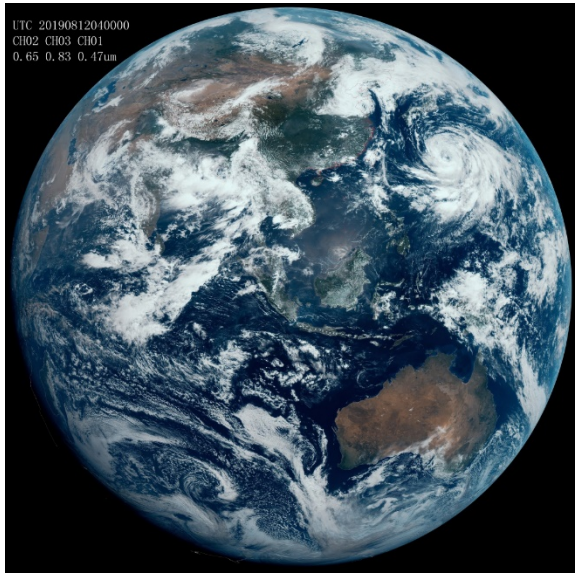


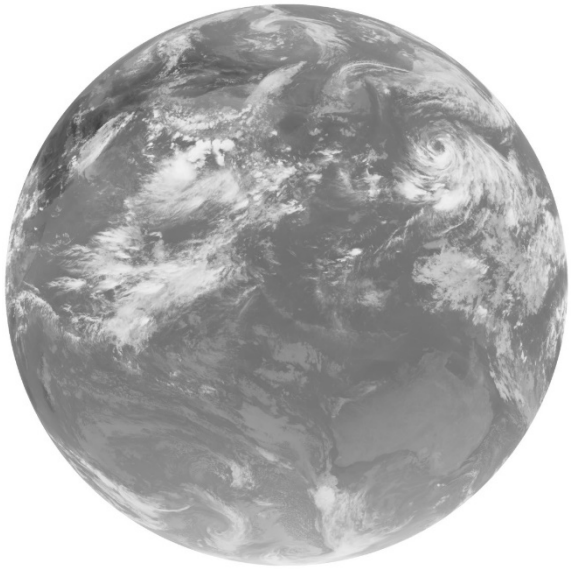


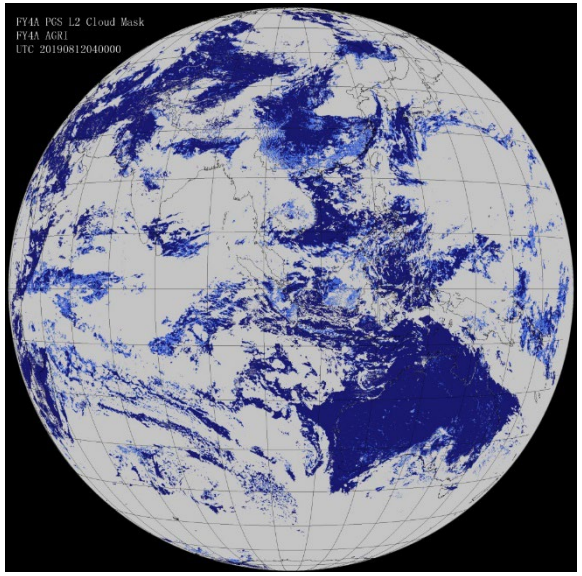
Courtesy of Dr.Yixuan Shou CMA/NSMC

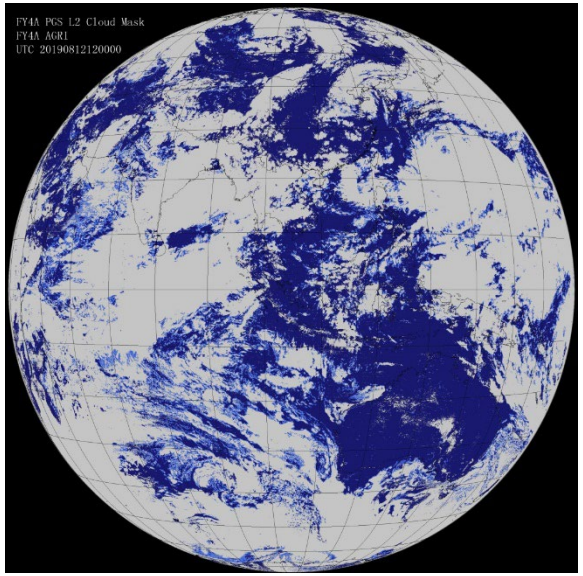
CMA/NSMC have update FY-4A TFTP algorithm and it will be operational at Q4 2019

FY-4A Cloud mask Products

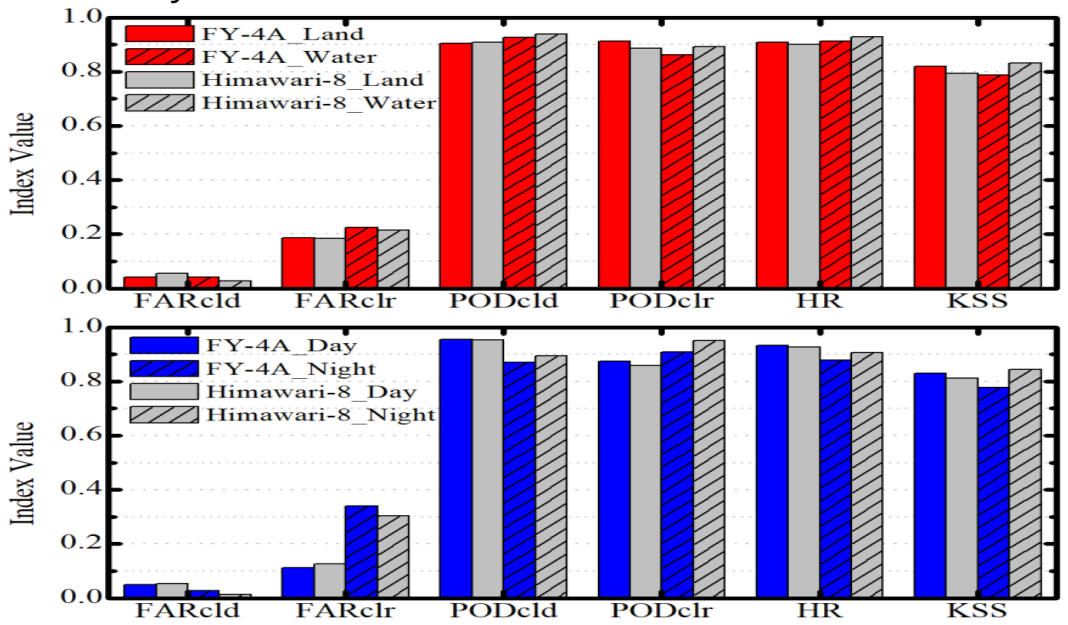








Cloud Mask products validation
July, 2019, 391 scenes



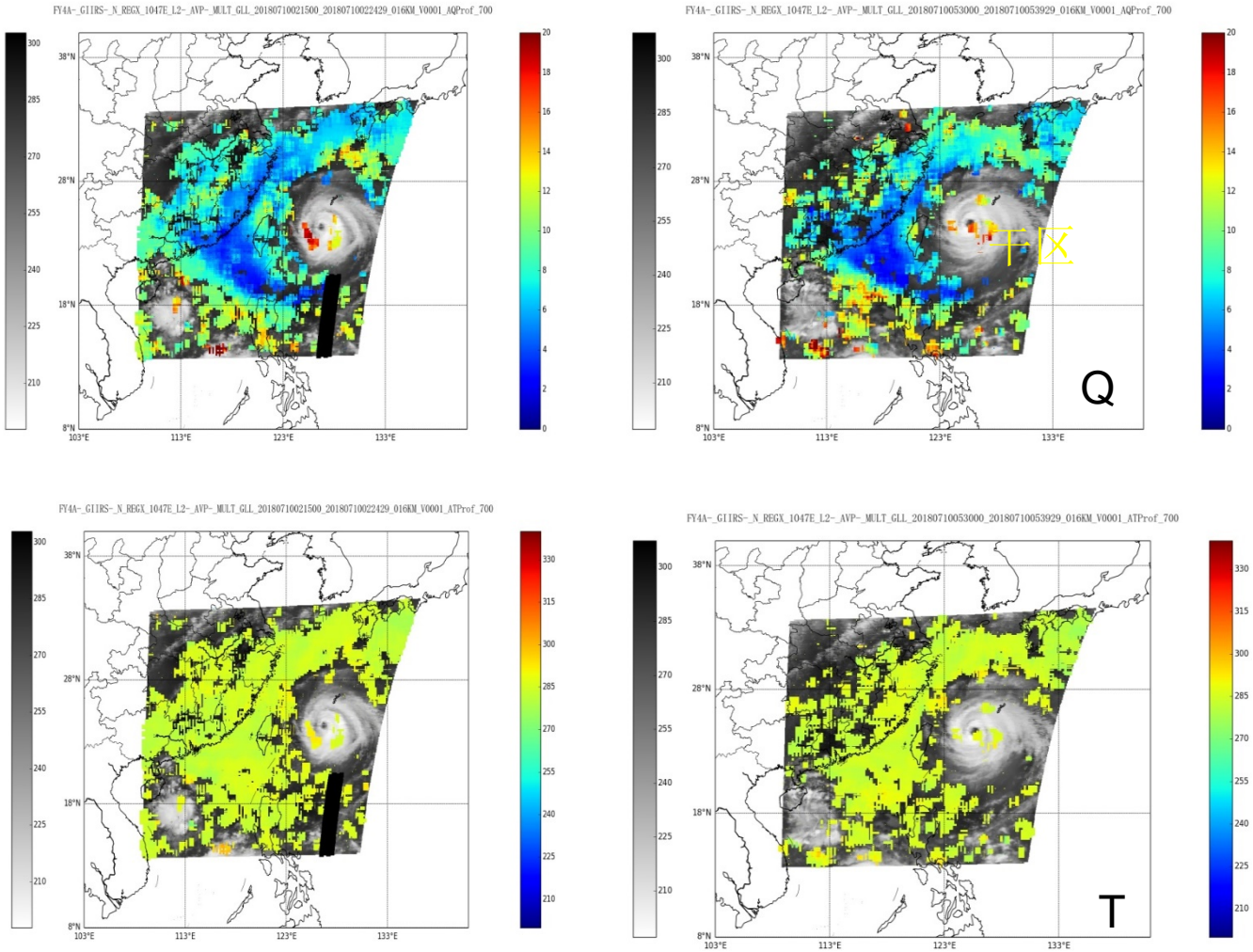
Validation Data	Cloud Mask Accuracy	KSSscore
AHI8	0.89	0.79
MOD35	0.91	0.65
MYD35	0.91	0.65
OBS	0.94	0.77

Courtesy of Dr.Xi Wang CMA/NSMC

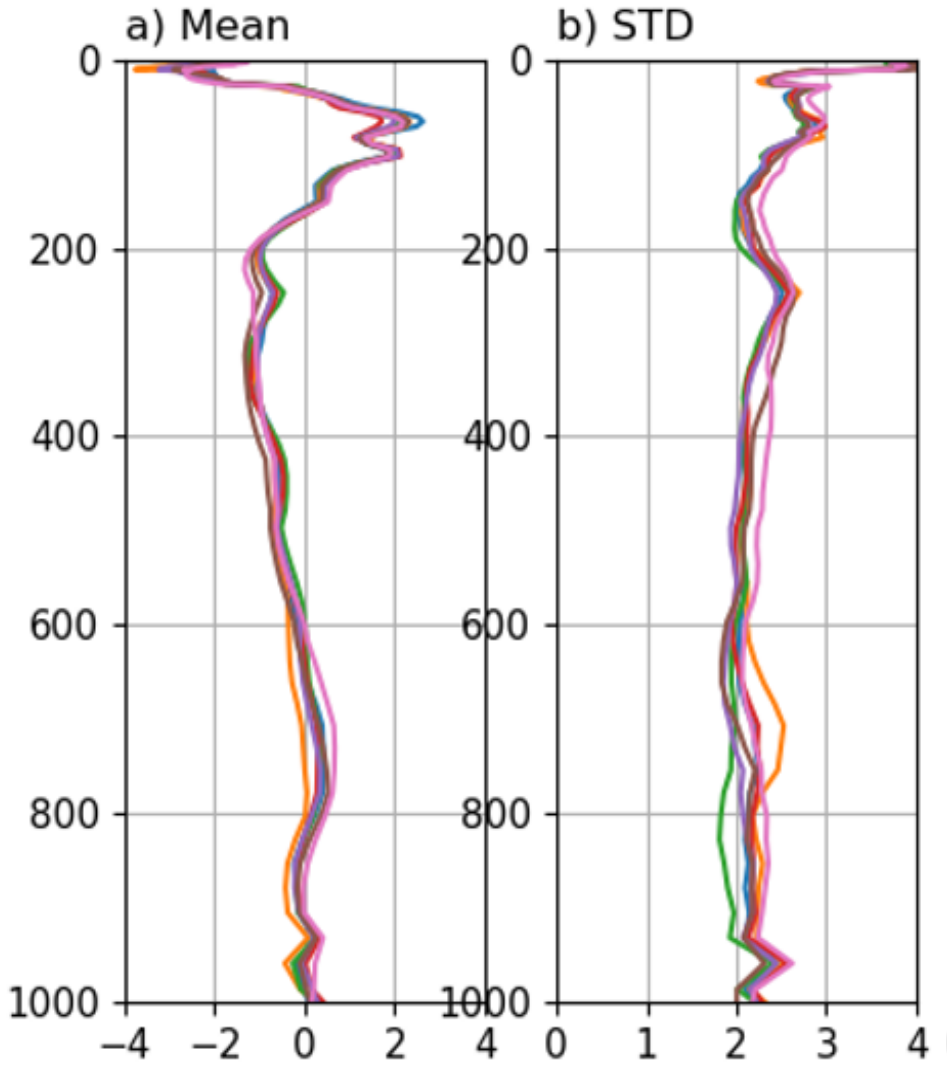
FY-4A GIIRS temperature and moisture products

10:15

13:30



FY-4A Atmospheric temperature profile validation

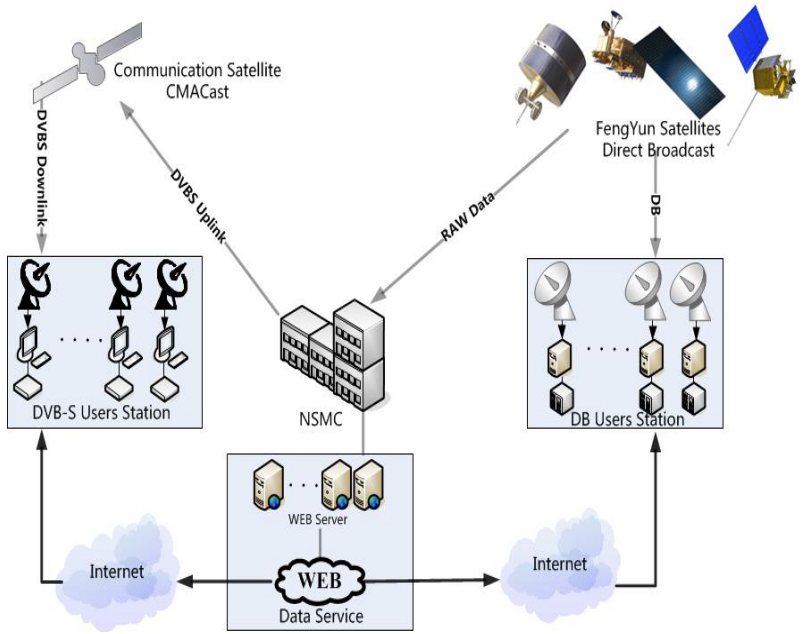


Courtesy of Dr. Cunqiang Wu CMA/NSMC

Data and Utilities

- **Real time**
  - **Direct Broadcast(DB)**
  - **CMACast(DVBS)**
- **Near Real Time**
  - **Website**
  - **Cloud Service**
  - FTP Service
  - Manual Service
- **Achieve**
  - Website
  - FTP Service
  - Manual Service

Fengyun GEO data access scenario

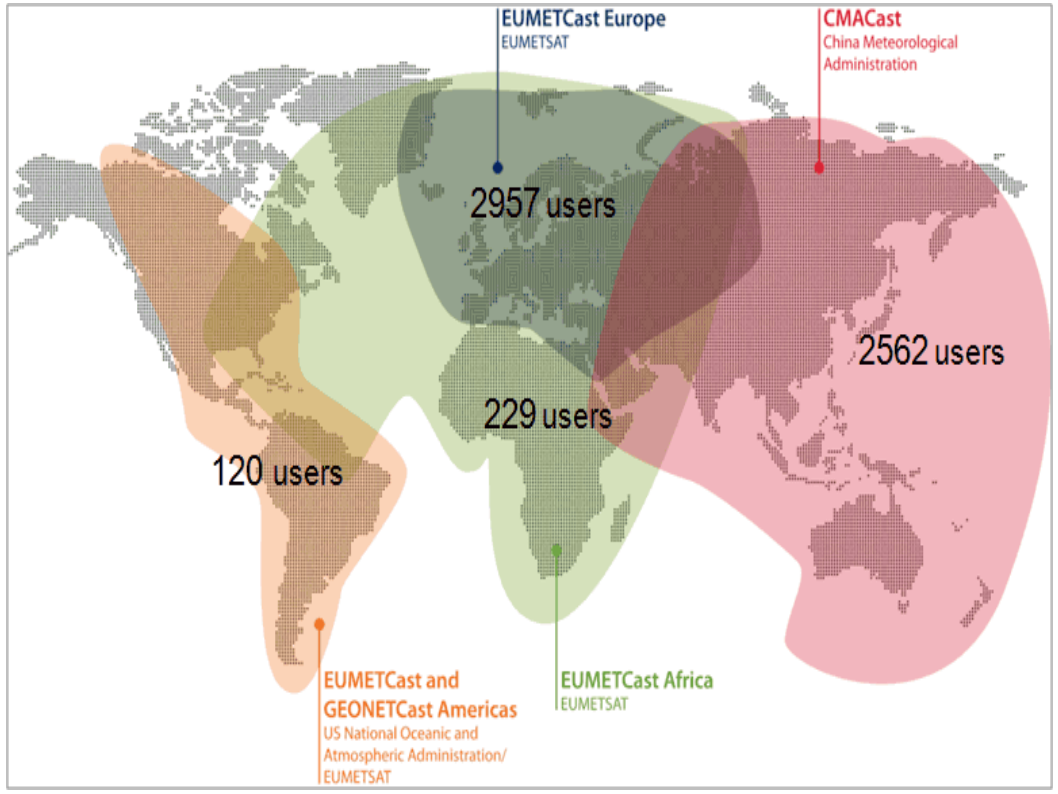


http://www.nsmc.org.cn/en/NSMC/Channels/100029.html

All the FY-2/4 satellite data and products status are online accessible

CMACast in service

- Domestic users
  - Local weather stations, forestry, agriculture, aviation,, hydrology…
- International users
  - Laos(老挝), Iran, Bengal孟加拉（）, Indonesia, Maldives（马尔代夫）, Nepal, Mongolia（蒙古）, Malaysia, Pakistan, Thailand, Philippines, Uzbekistan, Kyrgyzstan, Sri Lanka, Korea, Vietnam, Myanmar（缅甸）, Australia, Kazakhstan…



FY-2/4 Direct DB in service

Satellite Weather Application Platform (SWAP)

Satellite Weather Application Platform (SWAP) is a comprehensive operational platform focusing on geostationary meteorological satellites, realizing comprehensive display of FY-4A and FY-2 series satellite data, interactive typhoon positioning / intensity estimation, and strong convective system analysis. SWAP has the ability of displaying L1 data, channel compositing, playing animation, rendering L2 products etc.

Data Access

- Provincial CMACast default folder structure support
- Provincial direct receiving station HRIT format support
- Custom data access with configuration file
- System file selector and manual file selection support

Comprehensive FY4 and FY2 satellite data display

- Nominal geostationary satellite coordinate system support
- Single-frame cloud atlas and multi-frame animation support
- Flexible channel toggle and layer management
- Single channel pseudo-color enhancement with specific color map
- L2 data overlay display
- Cloud atlas animation file export
- FY-4A true color composite

Thematic application

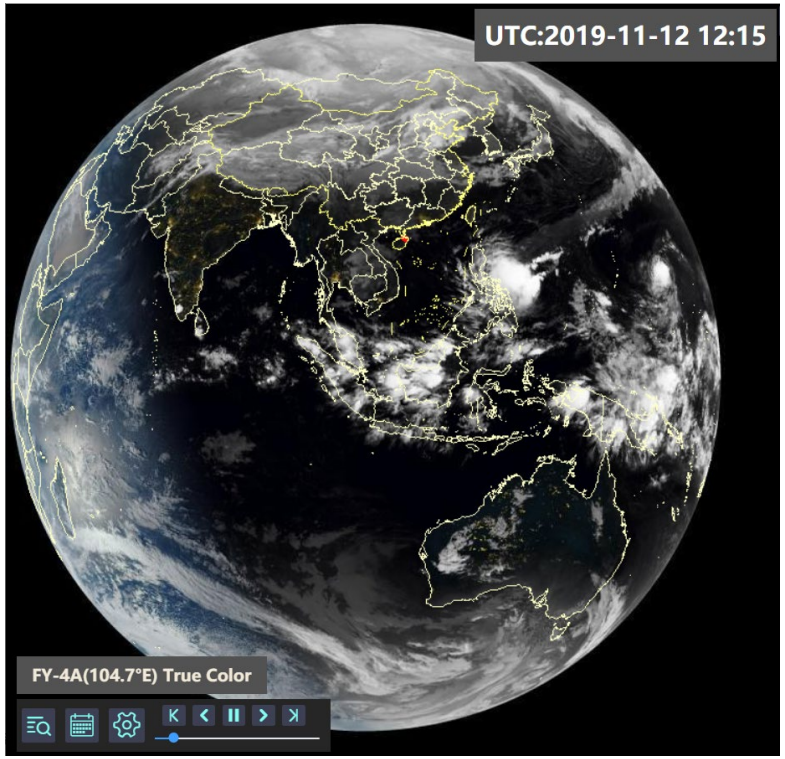
Strong convective system interactive analysis

- Default and manual ROI selection
- Interactive parameter configuration, real time analysis result display

Typhoon positioning and intensity estimation

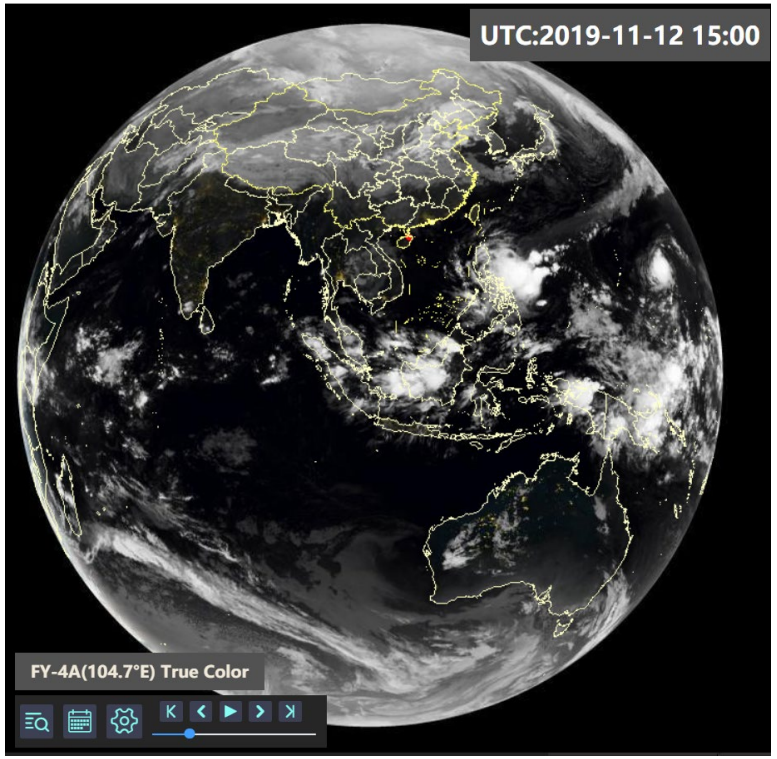
- Pixel level positioning and inverse positioning based on cloud atlas
- Interactive point selection and spiral fitting
- Spiral parameter adjustment

Satellite Weather Application Platform international version



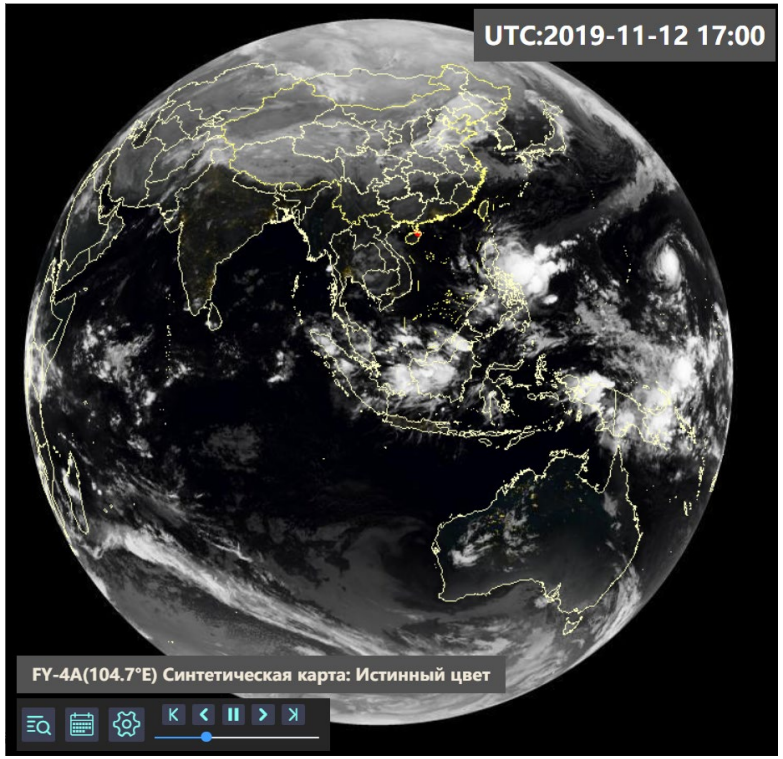
English version

http://rsapp.nsmc.org.cn/geofy/en



Chinese version

http://rsapp.nsmc.org.cn/geofy



Russian version

http://rsapp.nsmc.org.cn/geofy/ru

L1 data display： FY-4A

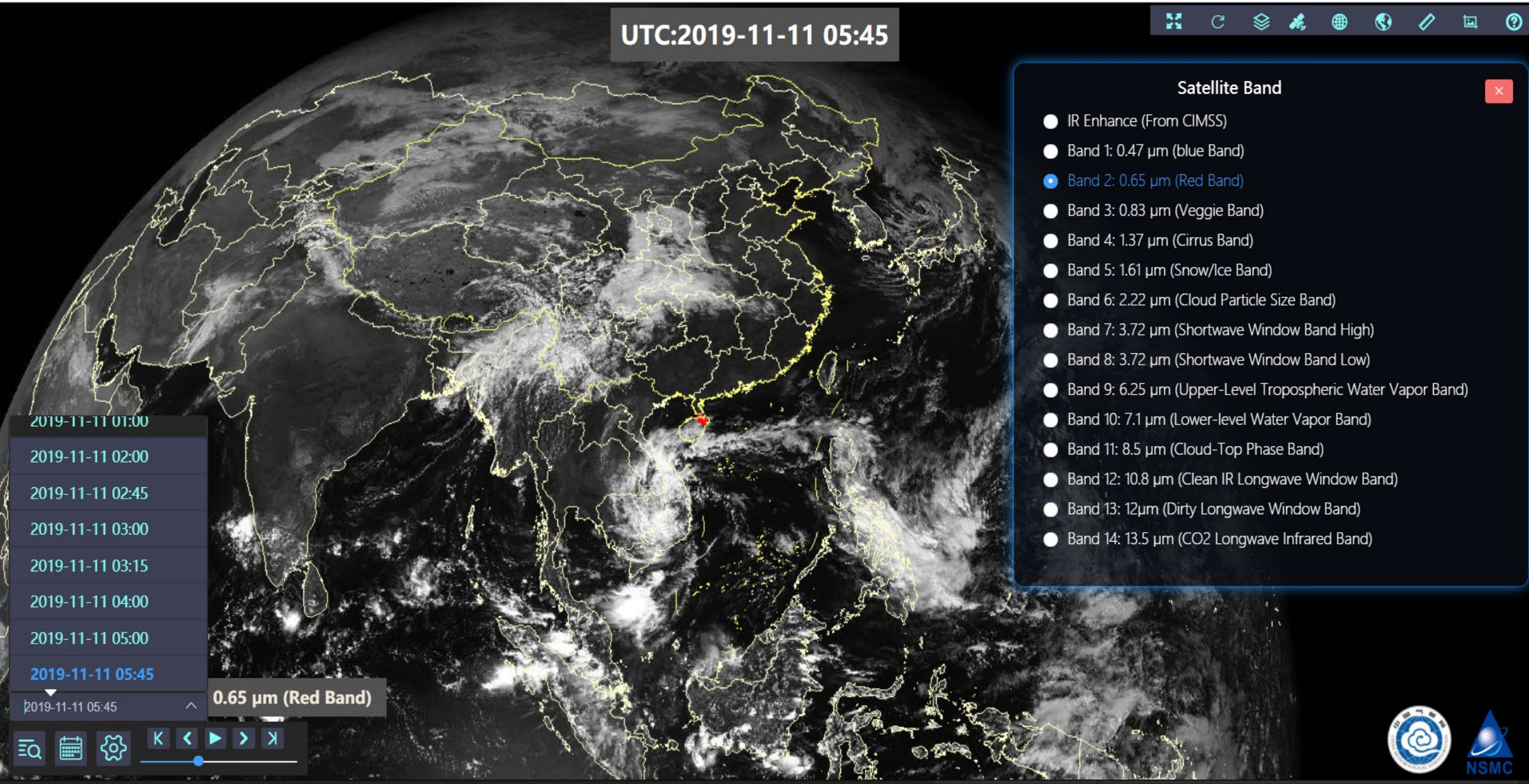
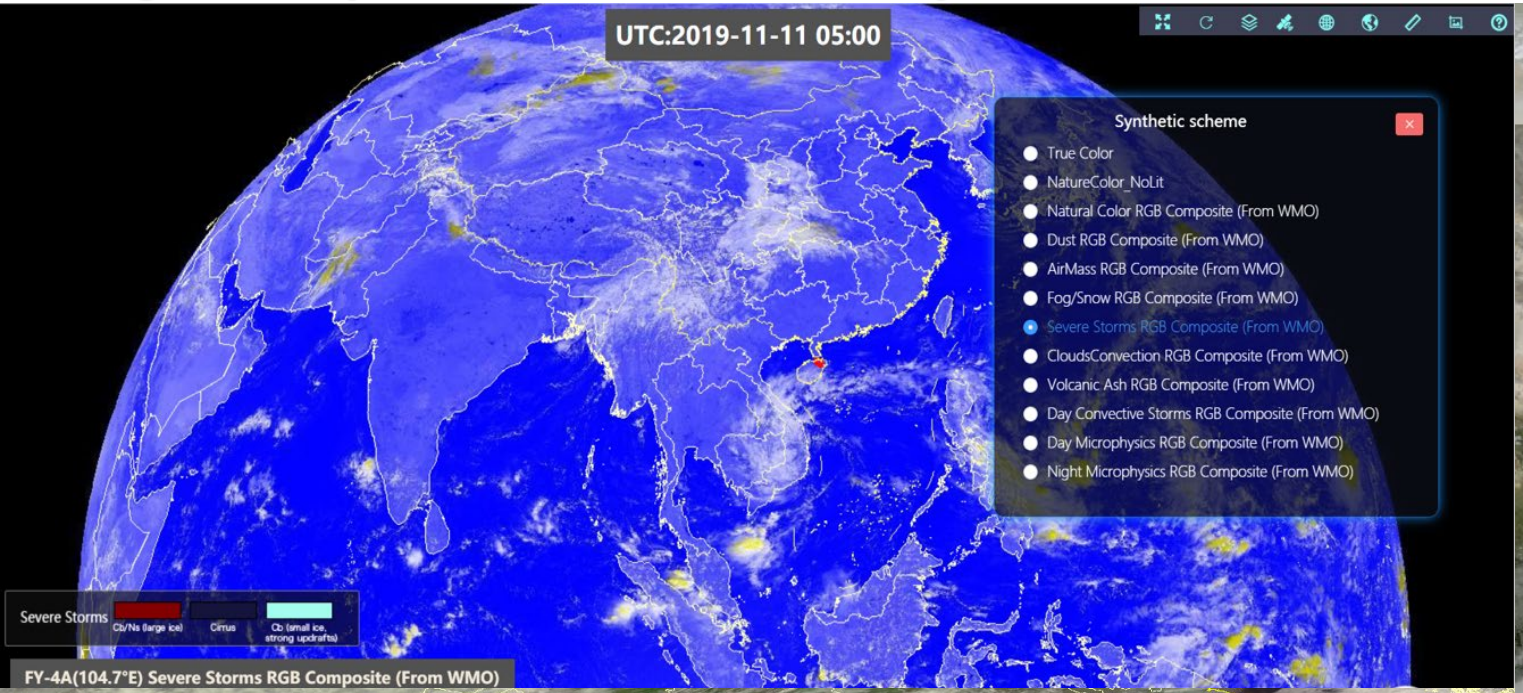
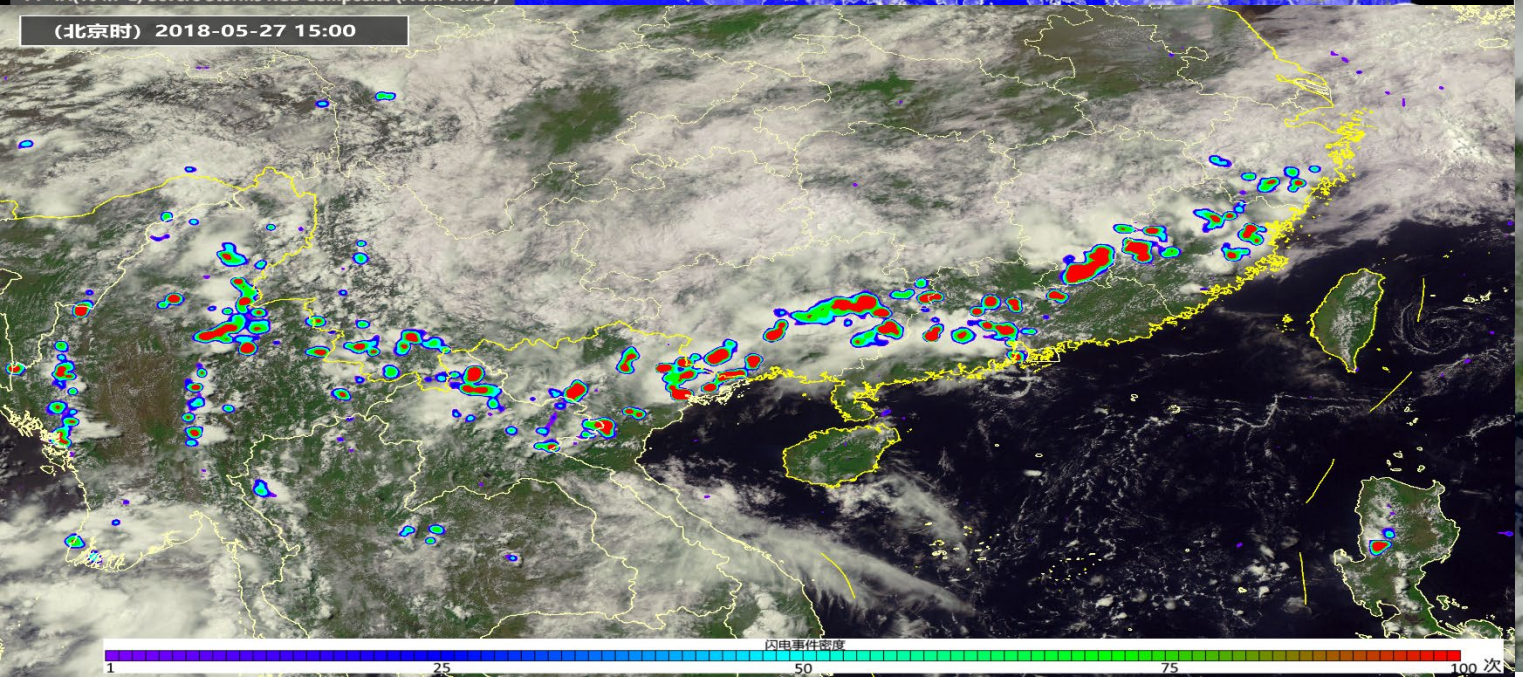
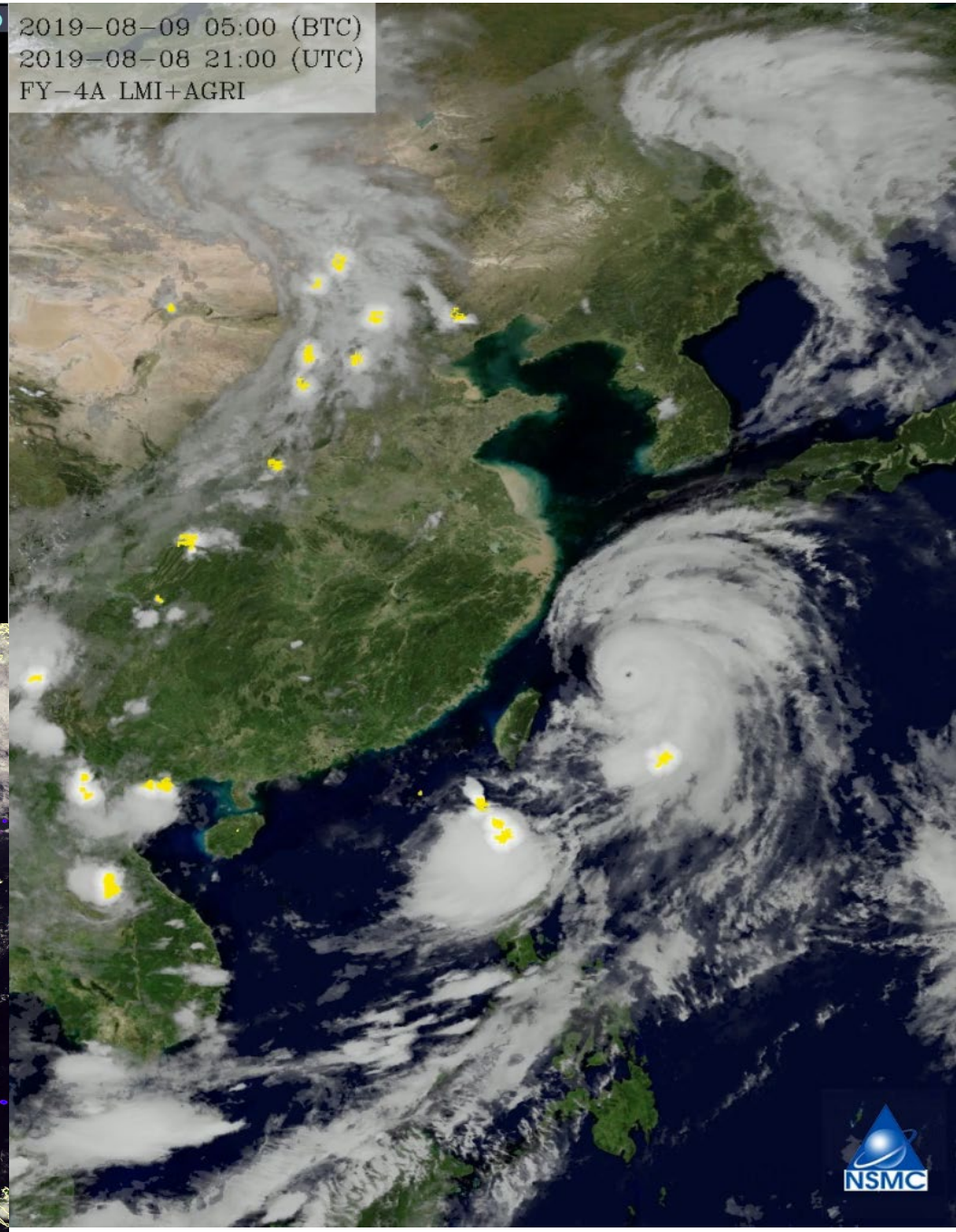


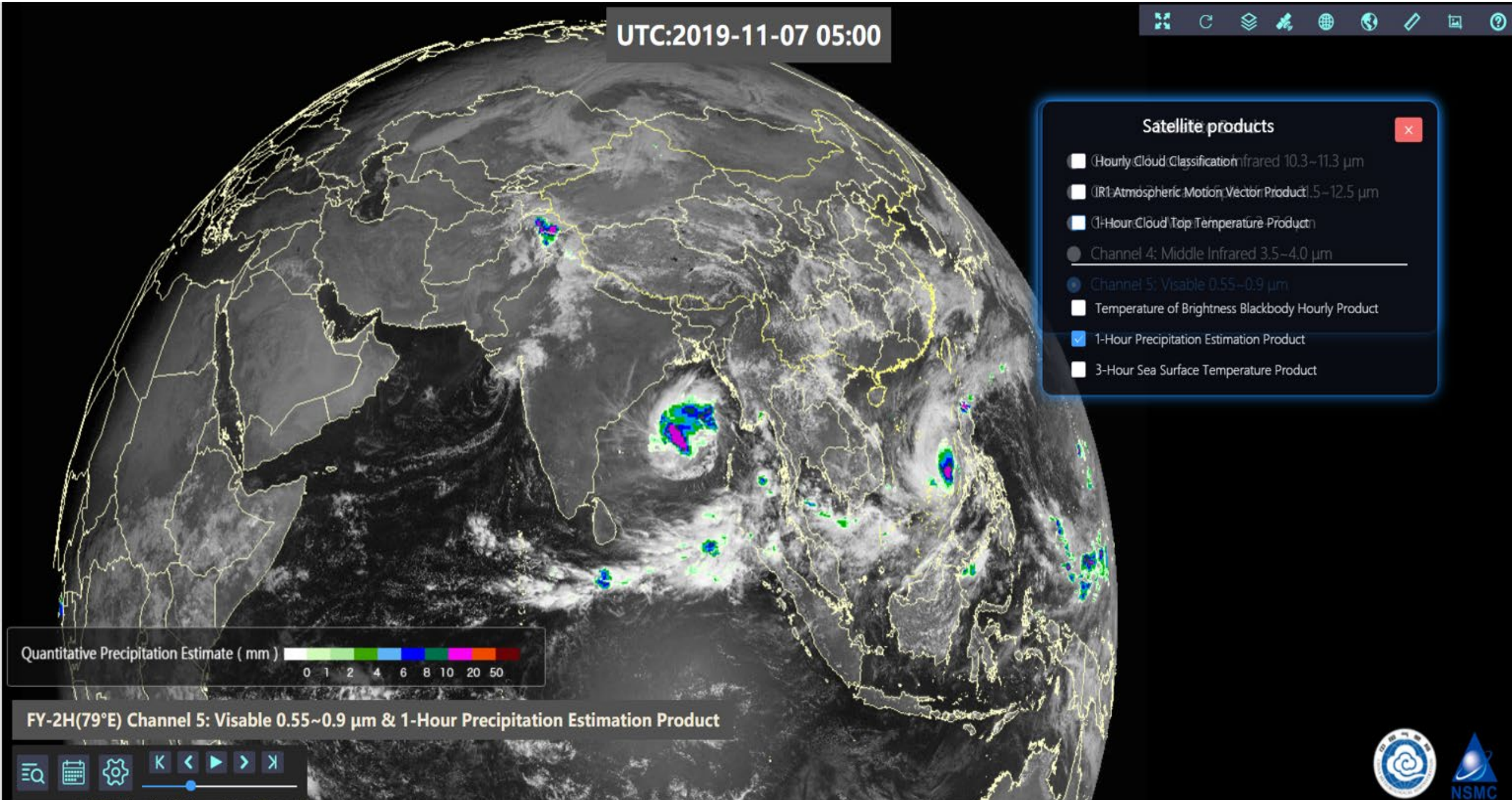
image composite and data analysis： FY-4A



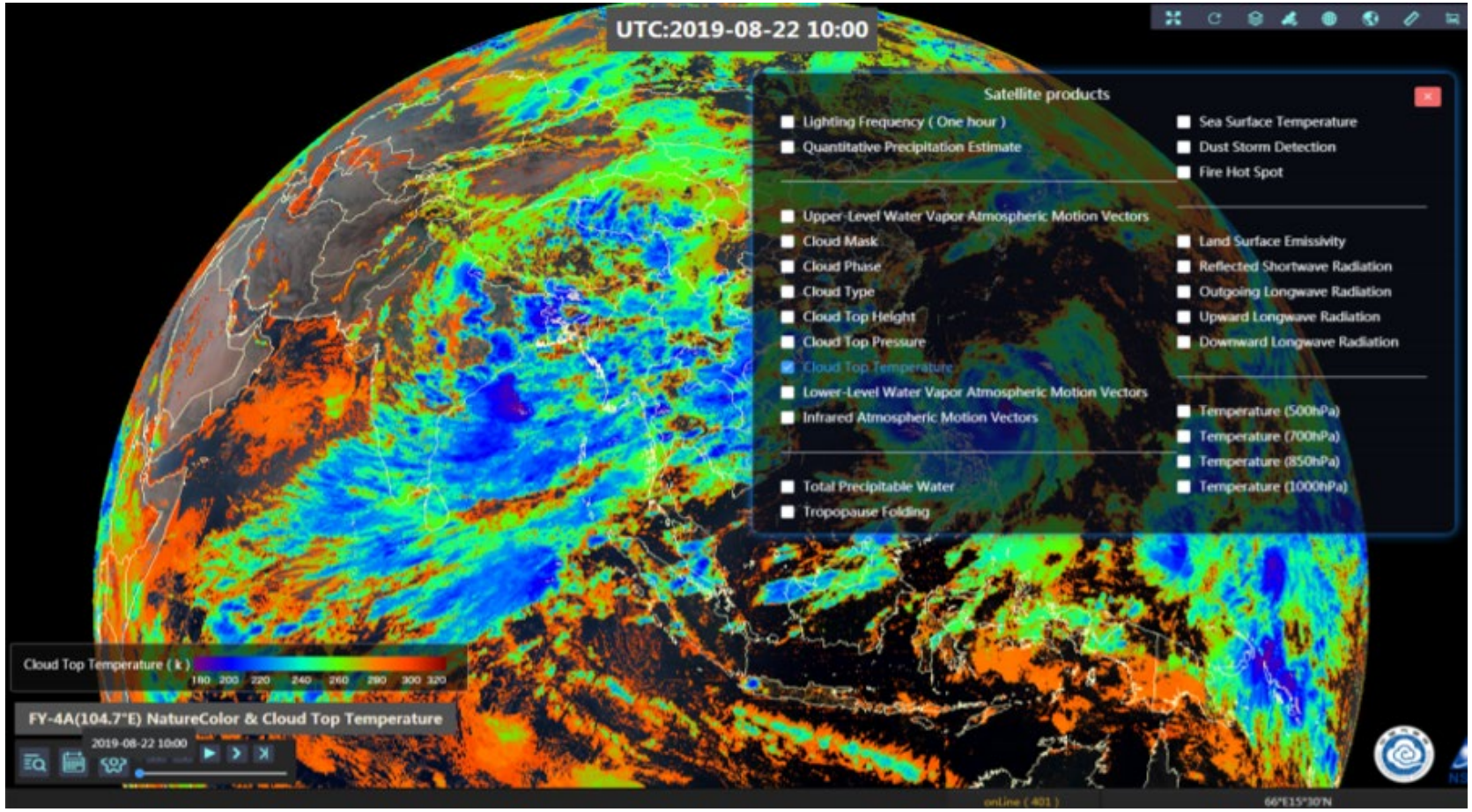




L2 products display： FY-2

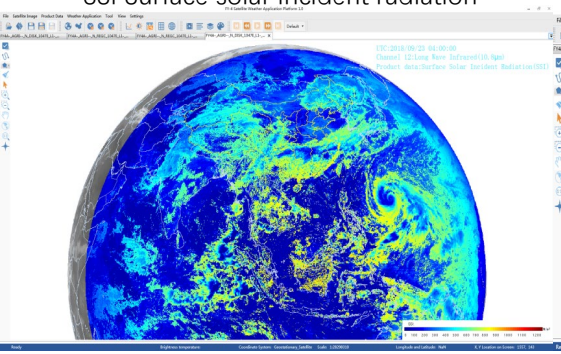


L2 product display： FY-4A

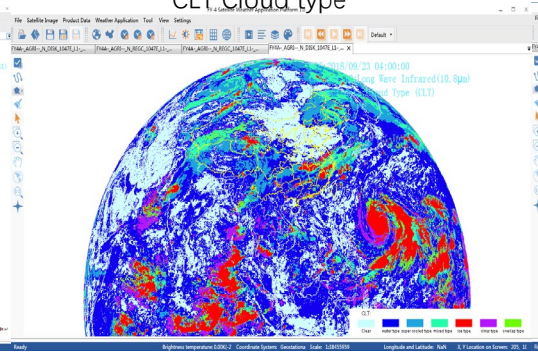


SWAP Support 28 Products
Cloud Mask
Cloud Type
Dust Storm Detection
Outgoing Longwave Radiation
Quantitative Precipitation Estimate
Surface Solar Irradiance
Atmospheric Vertical Profile
Number of Lightning Events (Count/min)
Cloud Phase
Cloud Top Height
Cloud Top Temperature
Cloud Top Pressure
Downward Longwave Radiation (DLR)
Upward Longwave Radiation (ULR)
Reflected Shortwave Radiation (RSR)
Tropopause Folding
Land Surface Emissivity
Sea Surface Temperature
Fire Hot Spot
Layer Precipitable Water (Contain Total Precipitable Water)
Upper-Level Water Vapor Atmospheric Motion Vectors
Convective Initiation

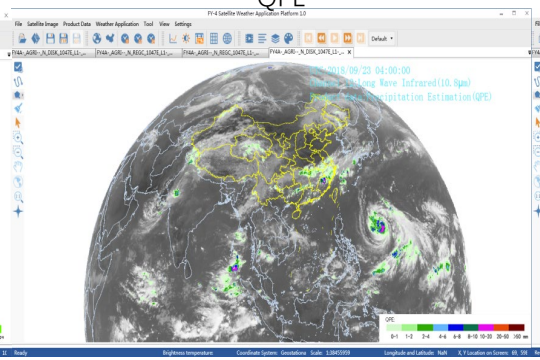
SSI Surface solar incident radiation



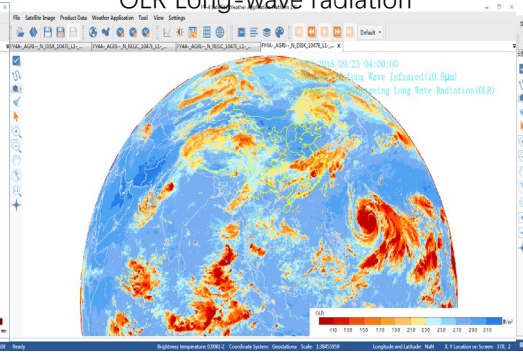
CLT Cloud type



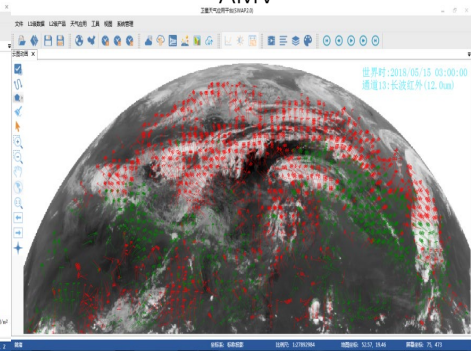
QPE



OLR Long-wave radiation

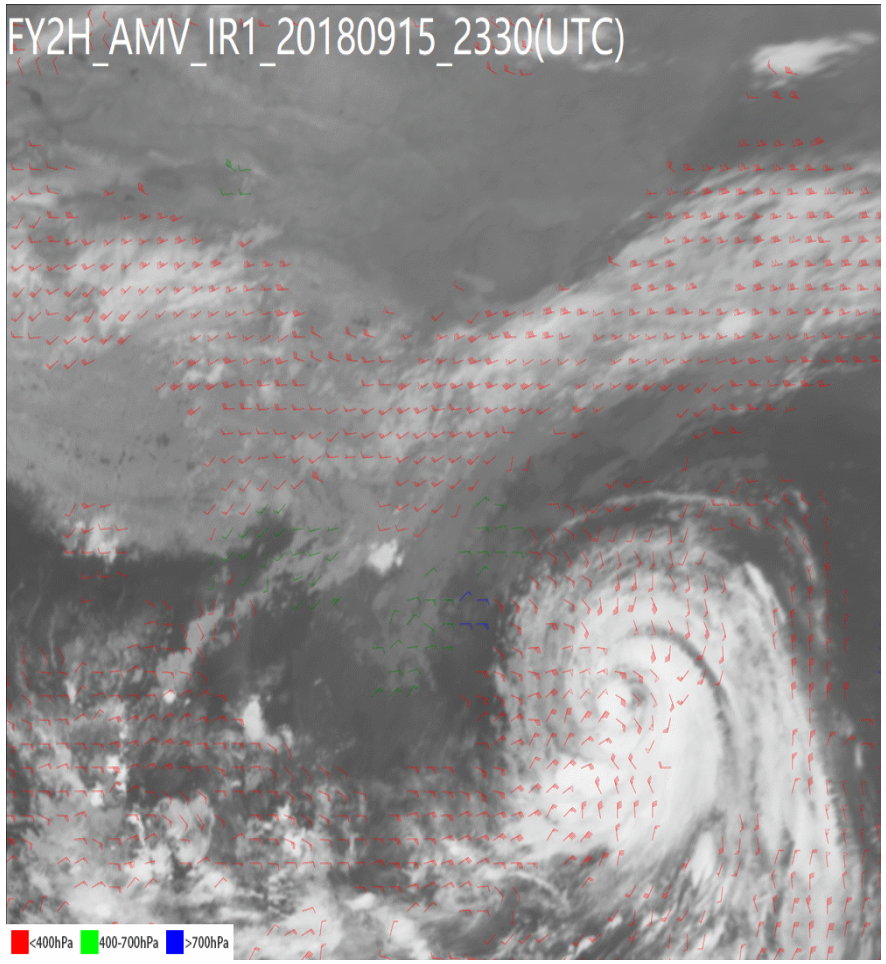


AMV

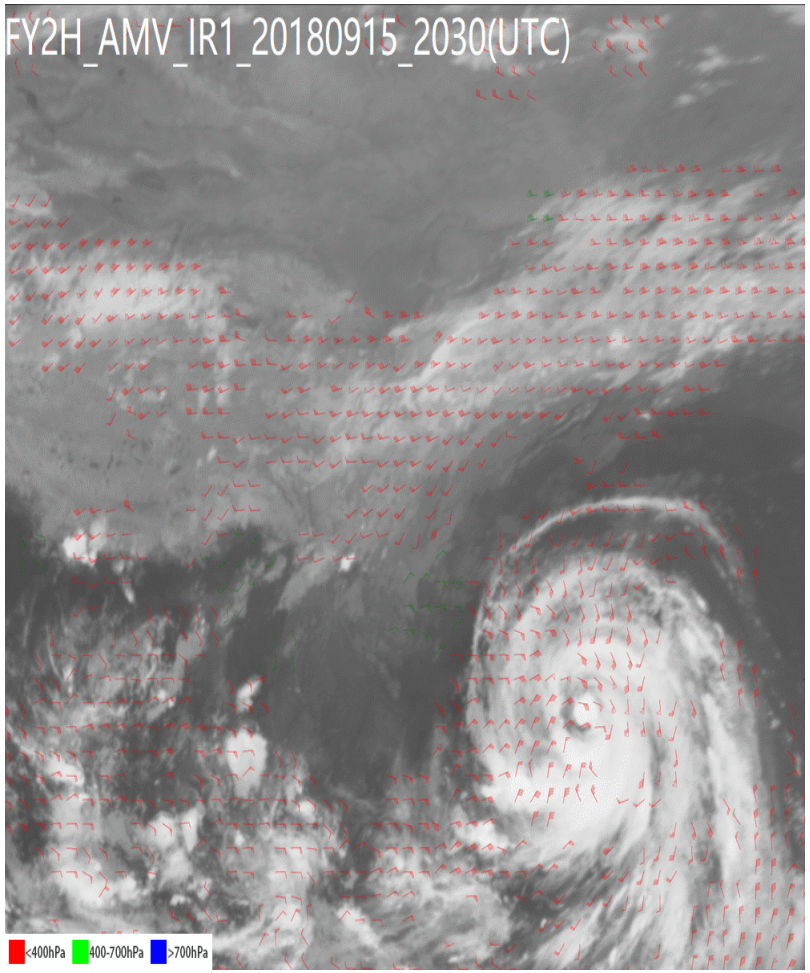


Lessons learned from Fengyun GEO system:
User engagement for FengYun GEO satellite product generation

FY-2F/G Every 6 hours



FY-2H Every half hours



OSCAR
Observing Systems Capability Analysis and Review Tool

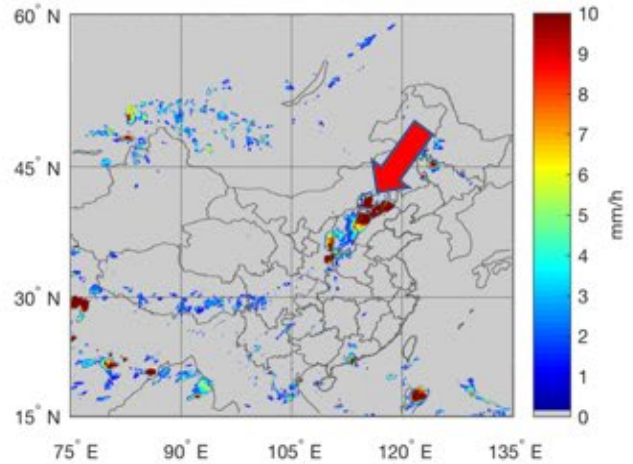
I d	Variable	Layer	App Area	Uncertainty	Stability / decade	Hor Res	Ver Res	Obs Cyc	Timeliness	Coverage	Conf Level	Val Date	Source
310	Wind (horizontal)	HS & M	Global NWP	1 m.s^{-1} 5 m.s^{-1} 10 m.s^{-1}		50 km 100 km 500 km	1 km 2 km 3 km	60 min 6 h 12 h	6 min 30 min 6 h	Global	firm	2009-02-10	John Eyre
453	Wind (horizontal)	LT	Nowcasting / VSRF	1 m.s^{-1} 2 m.s^{-1} 5 m.s^{-1}		1 km 5 km 20 km	0.2 km 0.5 km 1 km	5 min 30 min 3 h	5 min 15 min 60 min	Global	firm	2013-04-08	P. Ambrosetti
781	Wind (horizontal)	HS & M LS HT LT	Climate Monitoring (GCOS)	2 m.s^{-1}	0.5 m.s^{-1}	10 km	0.5 km	60 min		Global	reasonable	2019-09-25	GCOS-200:

CMA/NSMC provide FY-2H AMV covering North Hemisphere every half hour
Quick response to NWP and nowcasting requirement，according to WMO OSCAR capability analysis

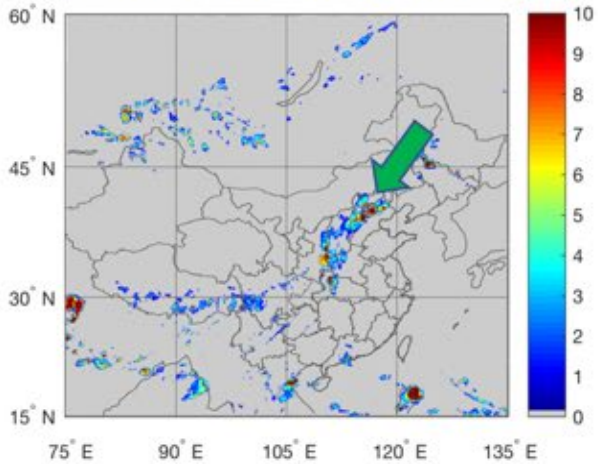
Courtesy of ProfXiaohu Zhang CMA/NSMC

Lessons learned from Fengyun GEO system:
User engagement for FengYun GEO satellite product improvement

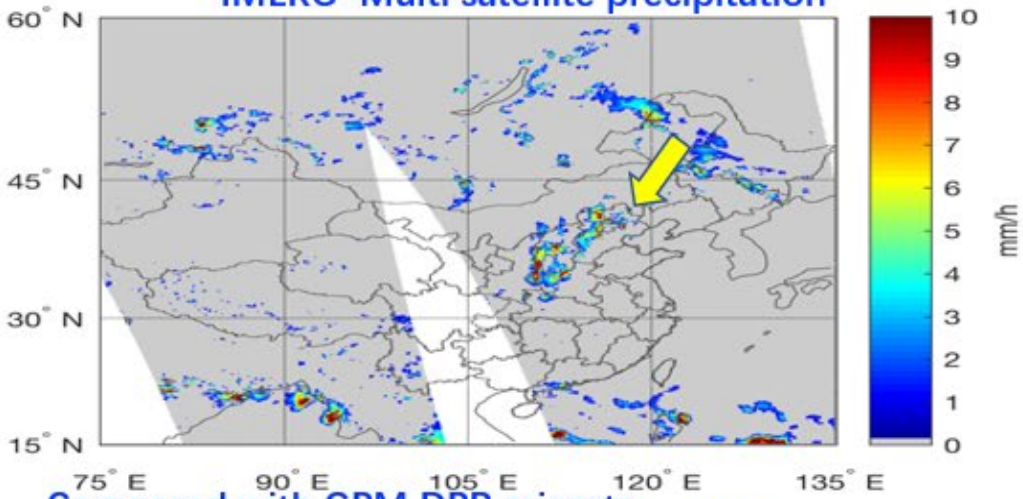
FY-4A Precipitation Ver.2018



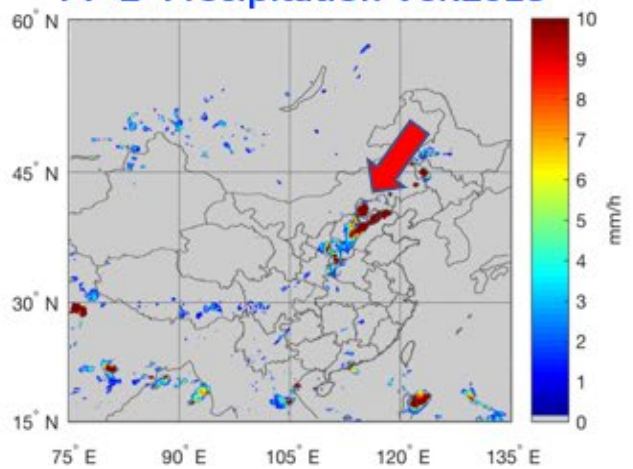
FY-4A Precipitation Ver. 2019



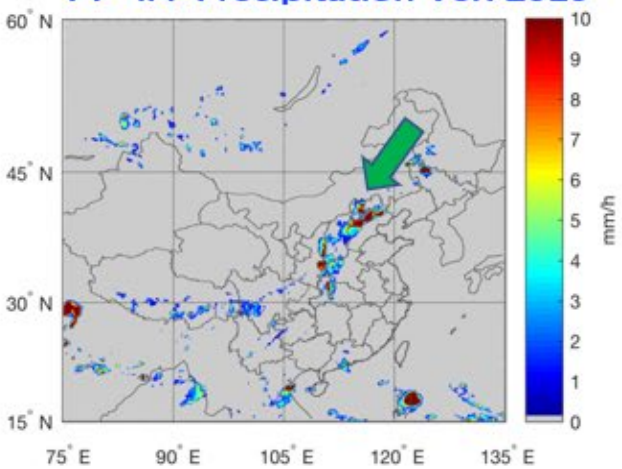
IMERG Multi satellite precipitation



FY-2 Precipitation Ver.2018

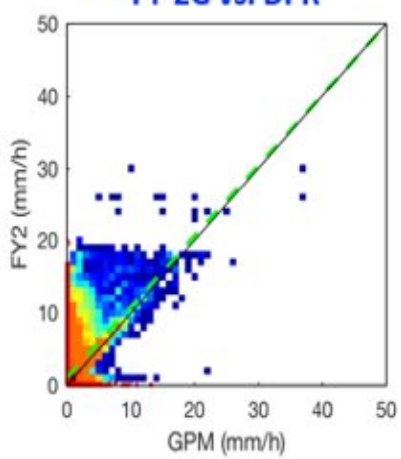


FY-4A Precipitation Ver. 2019

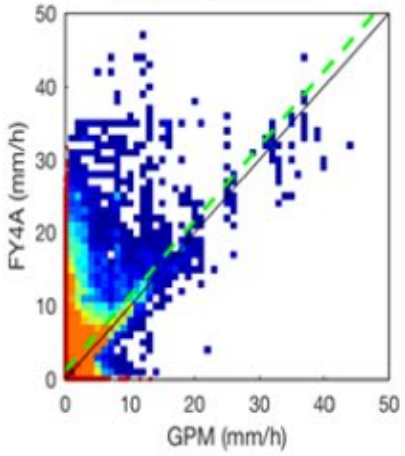


Compared with GPM DPR rainrate

FY-2G vs. DPR



FY-4A vs. DPR



NSMC

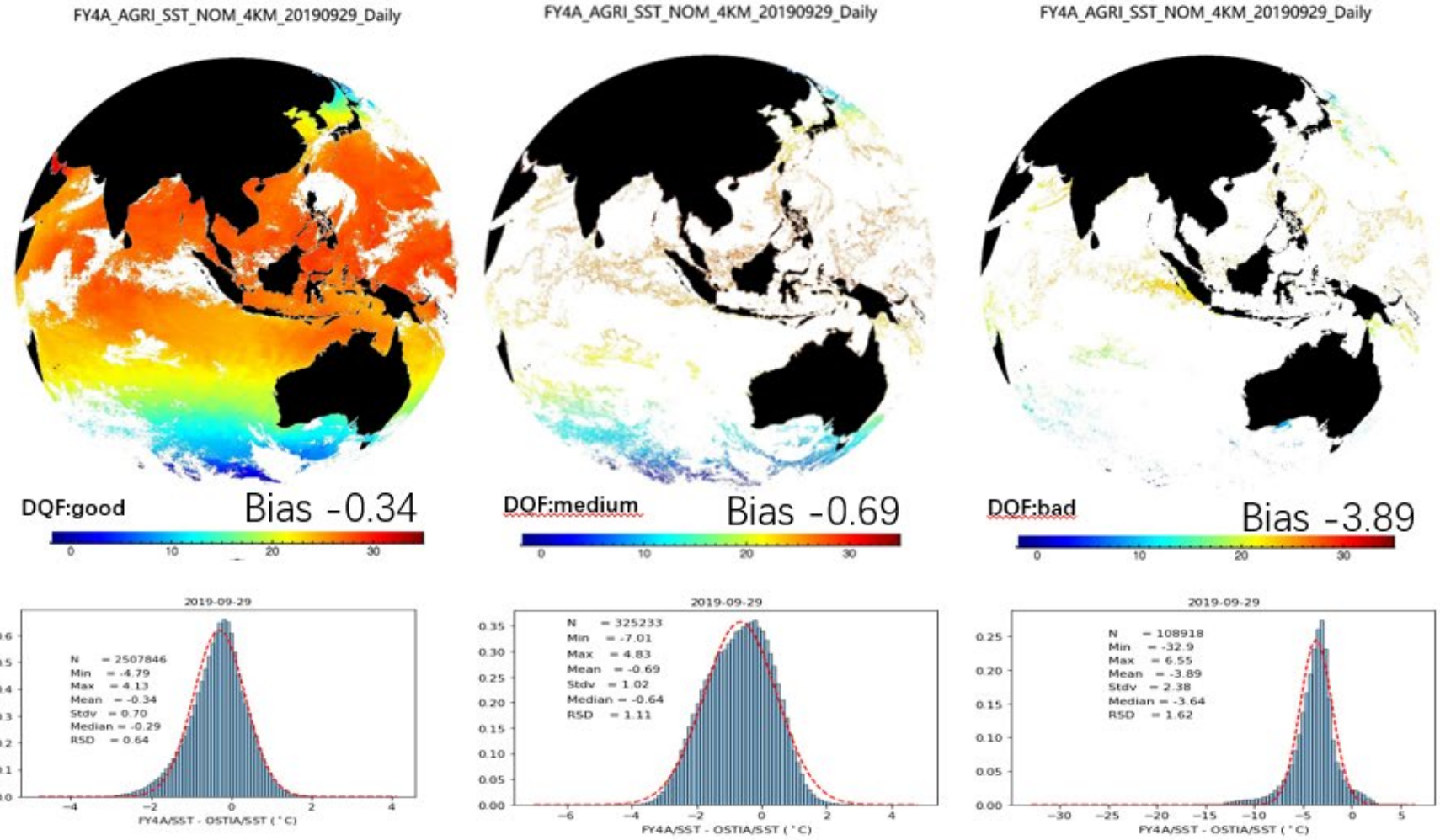
Courtesy of Dr.Ran You CMA/NSMC

CMA/NSMC have update FY-4A Precipitation algorithm and it will be operational at Q4 2019

Thanks for Shanghai Ecological Forecasting and remote sensing center products validation feedback

Lessons learned from Fengyun GEO system:
User feedback is very important for FengYun GEO satellite products

NSMC/CMA FY-4A L2 products have data quality flag（DQF）for each records



Data QualityFlag	DQF Level	caption
DQF	0	Good
	1	Medium
	2	Bad

Major retrieval bias comes from partly cloudy scenes

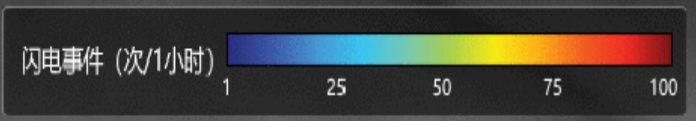
NSMC

Courtesy of Mr.PengCui and Dr.Sujuan Wang CMA/NSMC

Thanks for Shanghai Ecological Forecasting and remote sensing center verify this function in typhoon monitoring

Summary

- CMA/NSMC focuses on operational satellite meteorological applications and capacity building. In-depth research and demonstration efforts are encouraged for the applications of new data in weather analysis, NWP, Environment etc.,
- CMA will keep its commitment to open data policy for FengYun satellite data and products. Engagement of regional and global users in the application of FengYun data and products are welcome.
- International partnerships are essential. Users community is a very important value added benefit to CMA satellite applications.



FY-4A 通道 9: 6.25 μm 高层水汽 & 闪电事件（1小时）

NSMC


شكرا
Merci
ありがとう
terima kasih
obrigado
谢谢
Gracias
спасибо
Thank you
감사합니다