Introduction to Applications of Fengyun Meteorological Satellites

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Outline

1. Fengyun Program Overview and Updates
2. Data, products and services to B&R countries
3. Typical Applications and Examples
4. Bilateral and international cooperation
5. Actions and plans

风 (FENG=Wind)

云 (YUN=Cloud)

https://www.sohu.com/a/488002311_120826213

風雲 FENGYUN SATELLITE PROGRAM

FENGYUN-1

First-generation polar-orbiting meteorological satellites

FY-1A
LD:07.Sep.1988
EOL:16 Oct 1988

FY-1B
LD:03.Sep.1990
EOL:05 Aug 1991

FY-1C
LD:10.May.1999
EOL:26 Apr 2004

FY-1D
LD:15.May.2002
EOL:01 Apr 2012

FENGYUN-2

First-generation geostationary meteorological satellites

FY-2A
LD:10.Jun.1997
EOL:08 Apr 1998

FY-2B
LD:25.Jun.2000
EOL:Sep 2004

FY-2C
LD:19.Oct.2004
EOL:23 Nov 2009

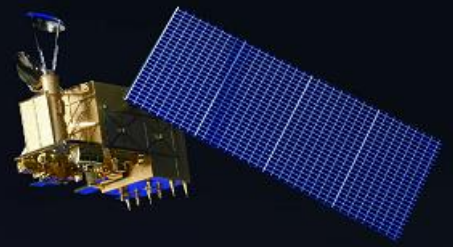
FY-2D
LD:08.Dec.2006
EOL:Jul 2015

FY-2E
LD:13.Dec.2008
EOL:31 Dec 2018

FY-2F
LD:13.Jan.2012
EOL:≥2021

FY-2G
LD:13.Dec.2014
EOL:≥2021

FY-2H
LD:05.Jun.2018
EOL:≥2022



FENGYUN-3

Second-generation polar-orbiting meteorological satellites

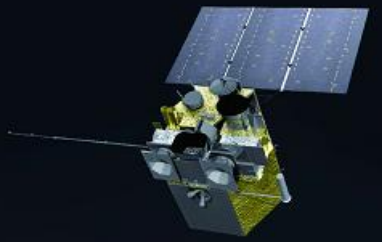
FY-3A
LD:27.May.2008
EOL:05 Jan 2015

FY-3B
LD:05.Nov.2010
EOL:≥2021

FY-3C
LD:23.Sep.2013
EOL:≥2021

FY-3D
LD:15.Nov.2017
EOL:≥2022

FY-3E
LD:05.Jul.2021
EOL:≥2026



FENGYUN-4

Second-generation geostationary meteorological satellites

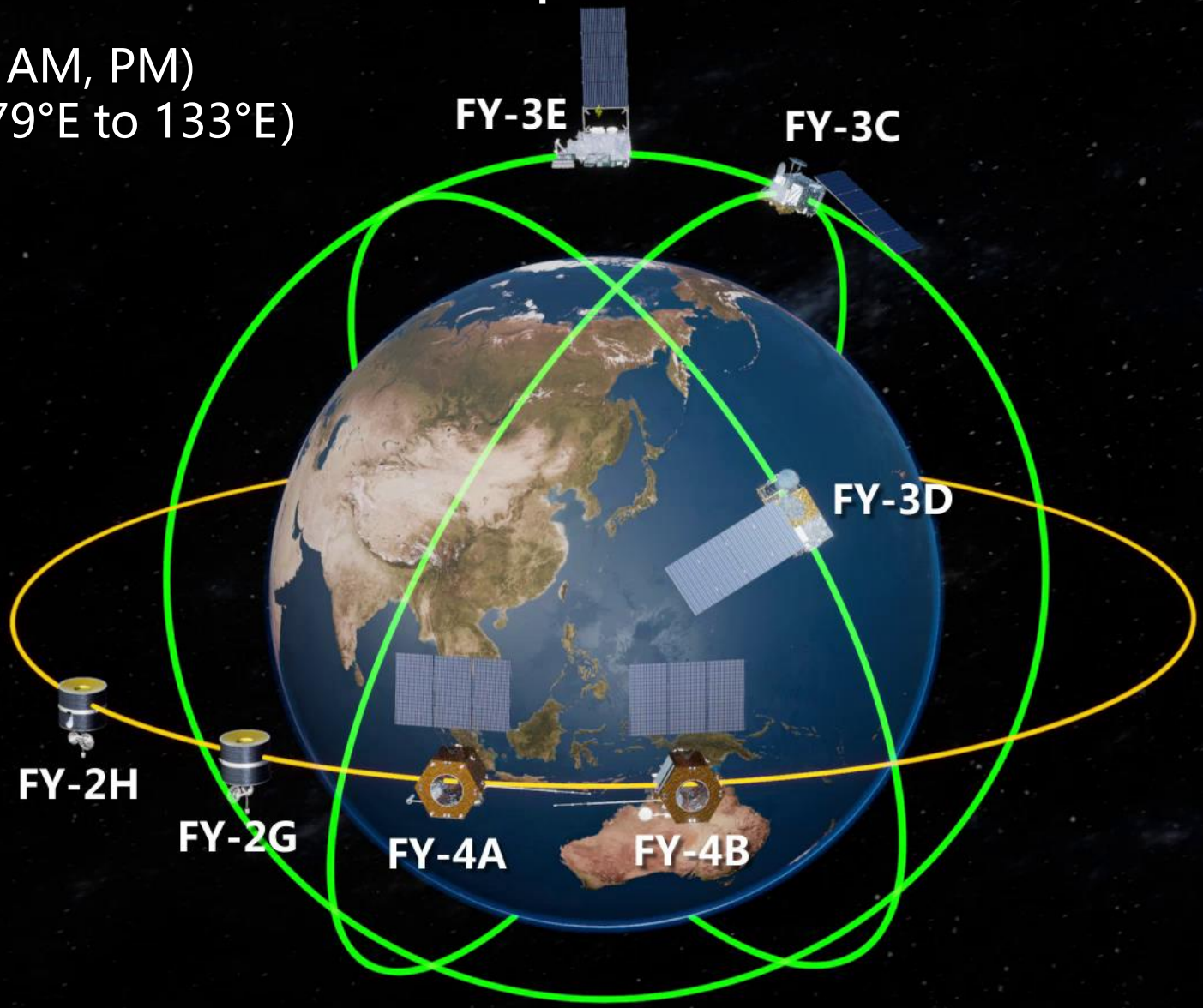
FY-4A
LD:11.Dec.2016
EOL:≥2021

FY-4B
LD:03.Jun.2021
EOL:≥2028

LD : Launch time
EOL : End of life

On-Orit in Operation （7 satellites）

LEO : 3 orbits (EM, AM, PM)
GEO: 4 positions (79°E to 133°E)



Overview of Fengyun satellite

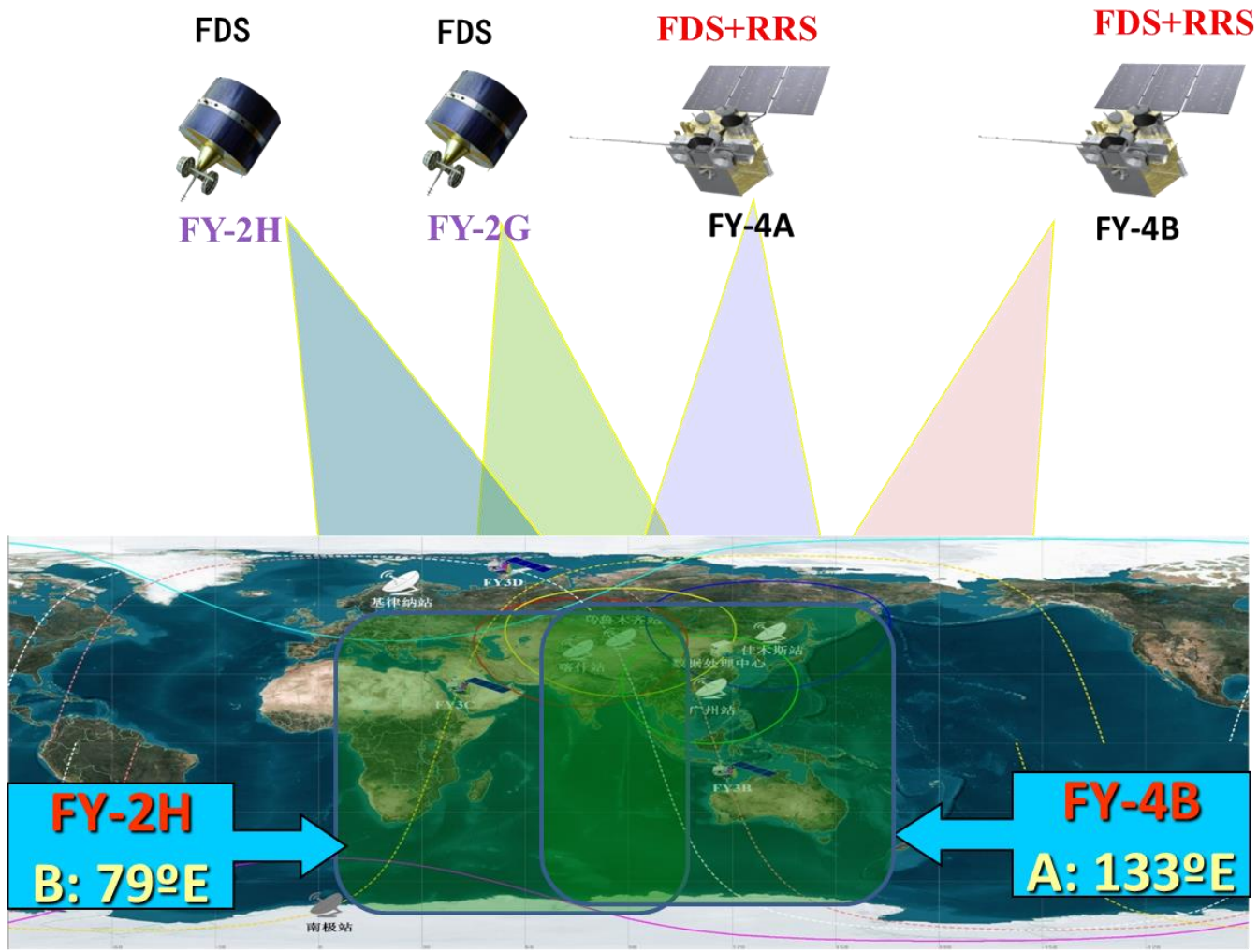
GEO constellation

The four GEO satellites, including FY2H, FY2G, FY4A and FY4B, were located at 79°, 99.5°, 104.7° and 133° east longitude respectively, covering the area from 14° east longitude to 162° west longitude.

Table 1 Current Fengyun GEO satellites (as of 1 June 2022)

Satellites currently in orbit	Location	Launch date	Status	Main instruments
FY-2G	99.5°E	31 Dec. 2014	Primary operation for full disk scan	VISSR(O) SEM(O)
FY-4A	104.7°E	11 Dec. 2016	Primary operation for full disk scan	AGRI(O) GIIRS(O) LMI(O) SEP(O)
FY-2H	79°E	5 Jun. 2018	Primary operation for full disk scan since 1 Jan., 2019	VISSR(O) SEM(O)
FY-4B	133°E	3 Jun. 2021	Trial operation since 1 Jun., 2022.	AGRI(O) GIIRS(O) GHI(O) SEP(O)

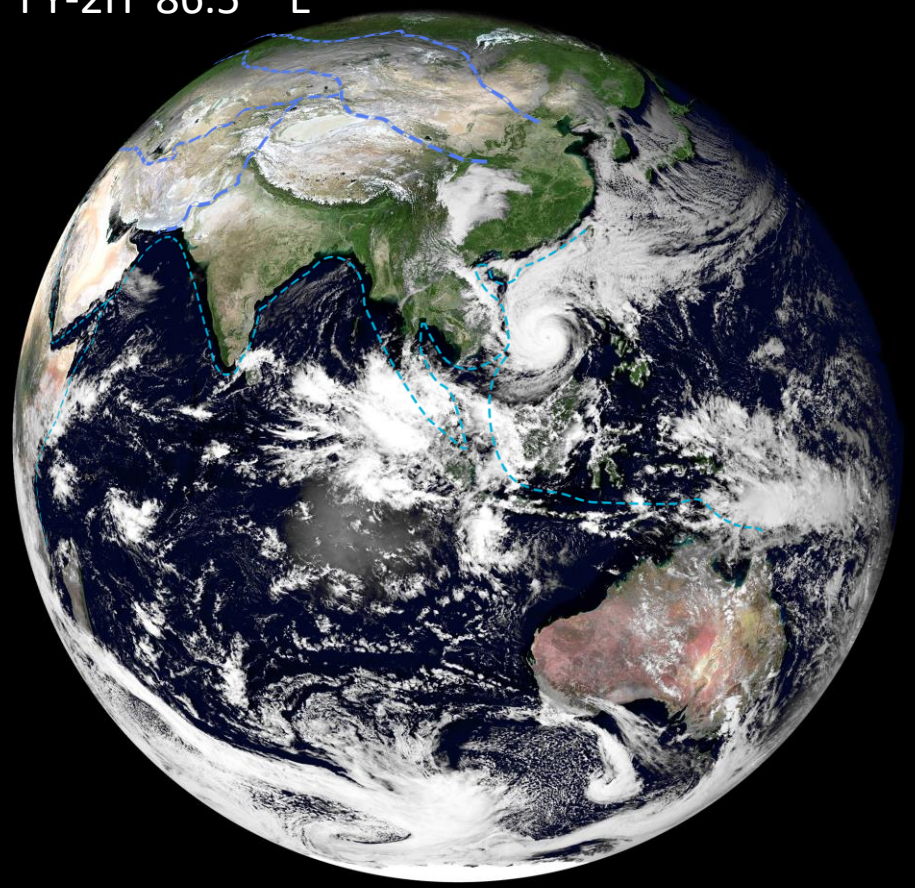
Note: (O) means the instruments working operationally, (S) means the instruments are shutdown.



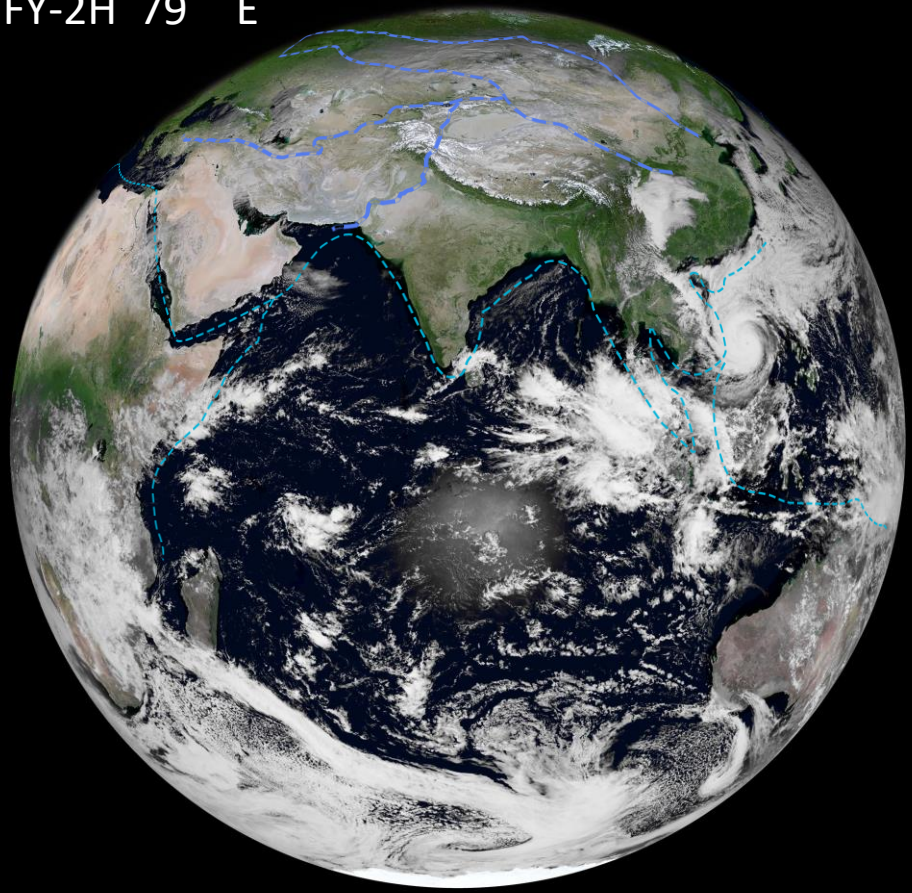
General layout of Fengyun GEO satellites

FY-2H : Satellite for Belt & Road

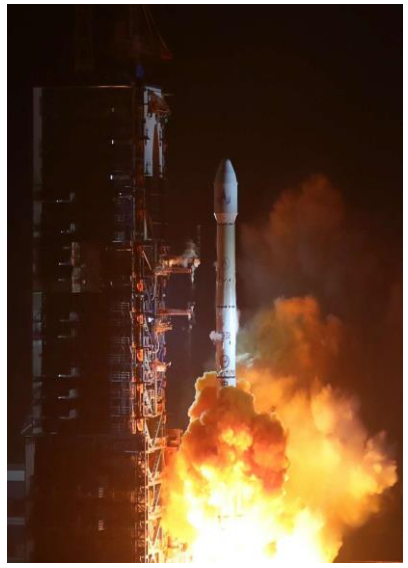
FY-2H 86.5° E

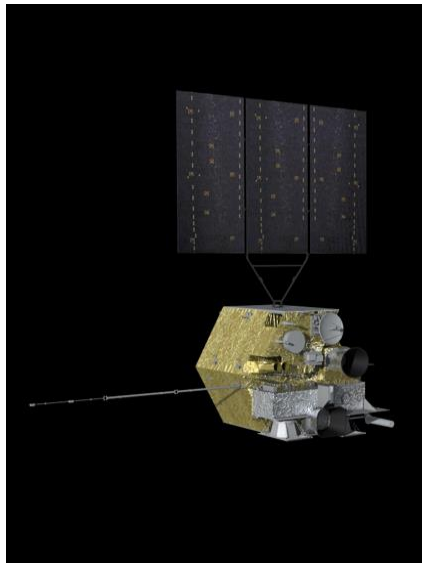


FY-2H 79° E



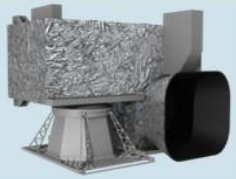
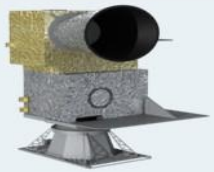
FY-4A: Launched on 11 Dec, 2016





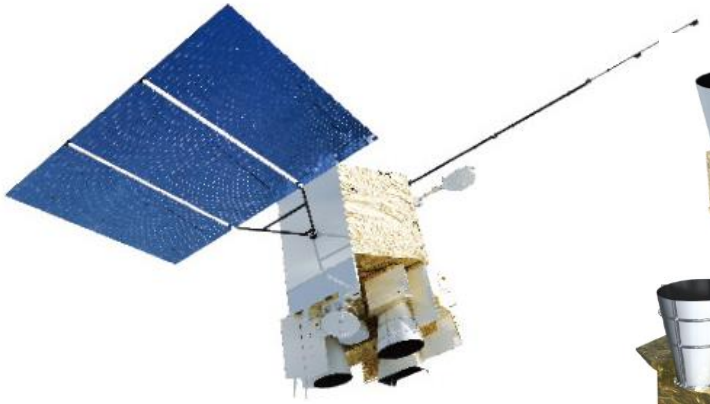
Spacecraft:

1. Launch Weight: approx 5300kg
2. Stabilization: Three-axis
3. Attitude accuracy: 3″
4. Bus: 1553B+Spacewire
5. Raw data transmission : X band
6. Output power: >= 3200W
7. Design life: over 7 years

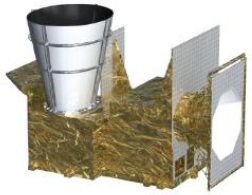
Instrument		Purposes
	***AGRI: Advanced Geosynchronous Radiation Imager***	14 -channel Earth images
	***GIIRS : Geostationary Interferometric InfraRed Sounder***	Clear-sky atmospheric temperature and humidity profiles
	***LMI : Lightning Mapping Imager***	Lightning distribution map in China area
	***SEP: Space Environment Package***	Space electric and magnetic environment information

FY-4B

- 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

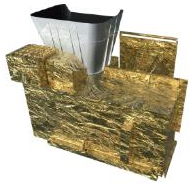


Geostationary High-speed Imager (GHI)

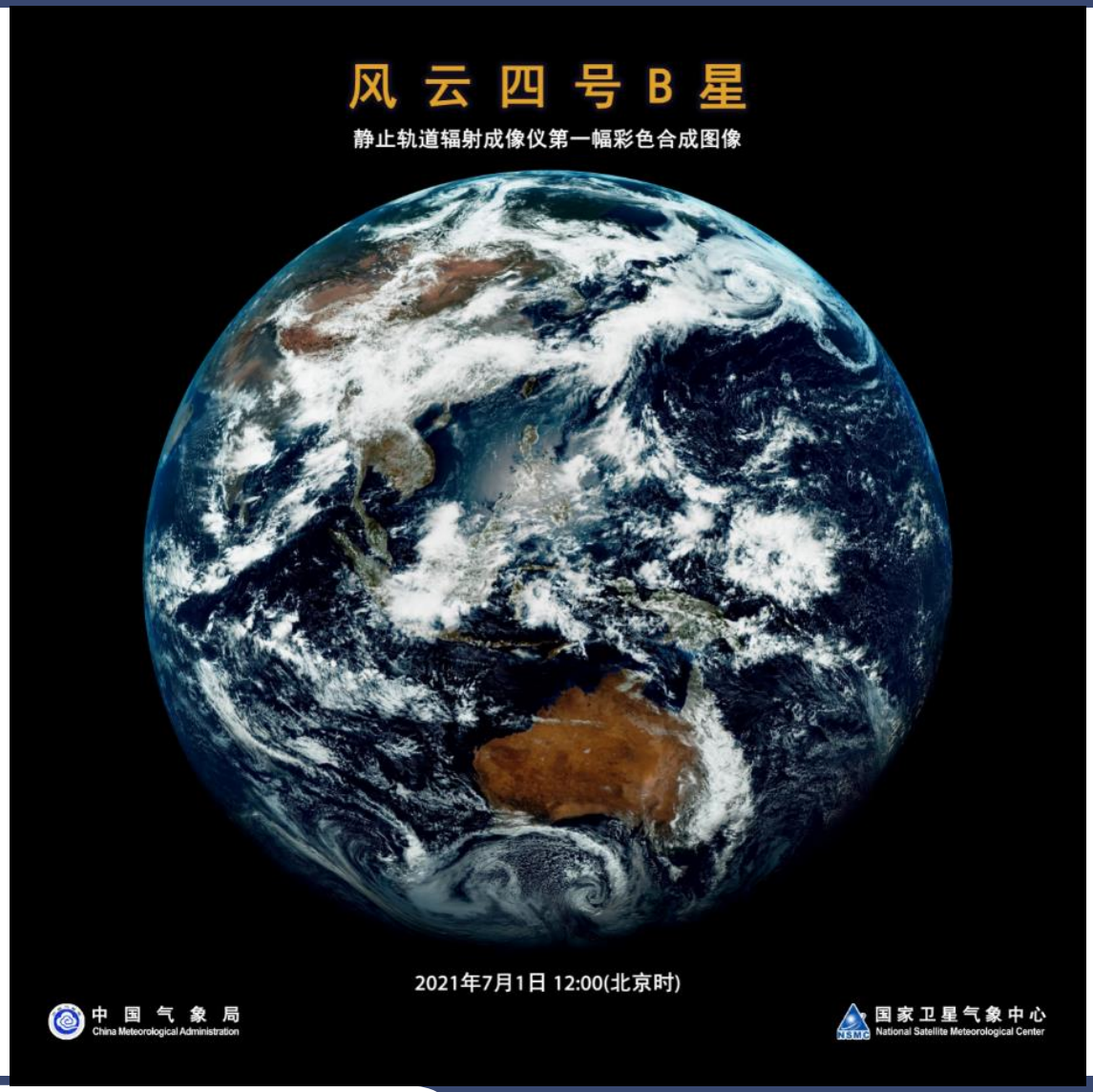


Geostationary Interferometric Infrared Sounder (GIIRS)

Space Environment Monitoring Instrument Package (SEP)



Advanced Geostationary Radiation Imager (AGRI)



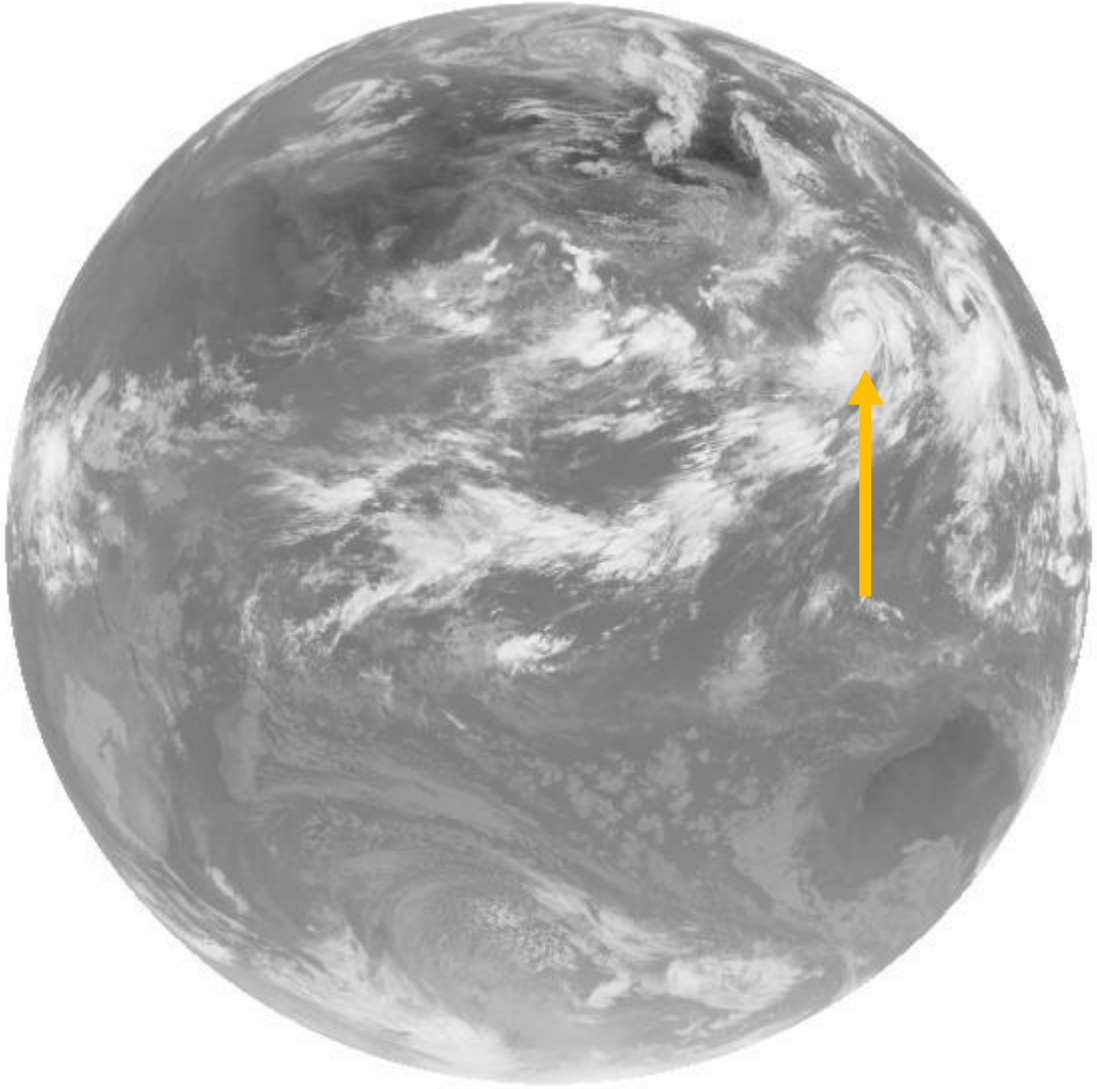
FY-2 and FY-4 Payloads

	FY-2(OP)	FY-4A(EXP)	FY-4B(OP)
Stabilization	Spin	Three-axis	Three-axis
Designed Life	4 Years	5~7 Years	5~7 Years
Observation efficiency	5%	85%	85%
Observation Mode	Imaging Only	Imaging +Sounding + Lightning Mapping	Imaging +Sounding
Main Instruments	VISSR: 5 channels SSP Resolution：1.25~5Km Global imaging：30min Flexible imaging ： 1D	AGRI :14 channels SSP Resolution：0.5~4Km Global imaging：15min Flexible imaging ： 2D	AGRI :15 channels SSP Resolution：0.5~4Km Global imaging：15min Flexible imaging ： 2D
	N/A	GIIRS:1650 channels SSP Resolution:16Km Spectral Resolution: 0.625cm-1	GIIRS:1650 channels SSP Resolution:12 Km Spectral Resolution: 0.625cm-1
	N/A	LMI： SSP Resolution:7.8Km	N/A
	SEM High energy particles Solar X ray fluxes	SEP High energy particles Magnetic field	SEP High energy particles Magnetic field

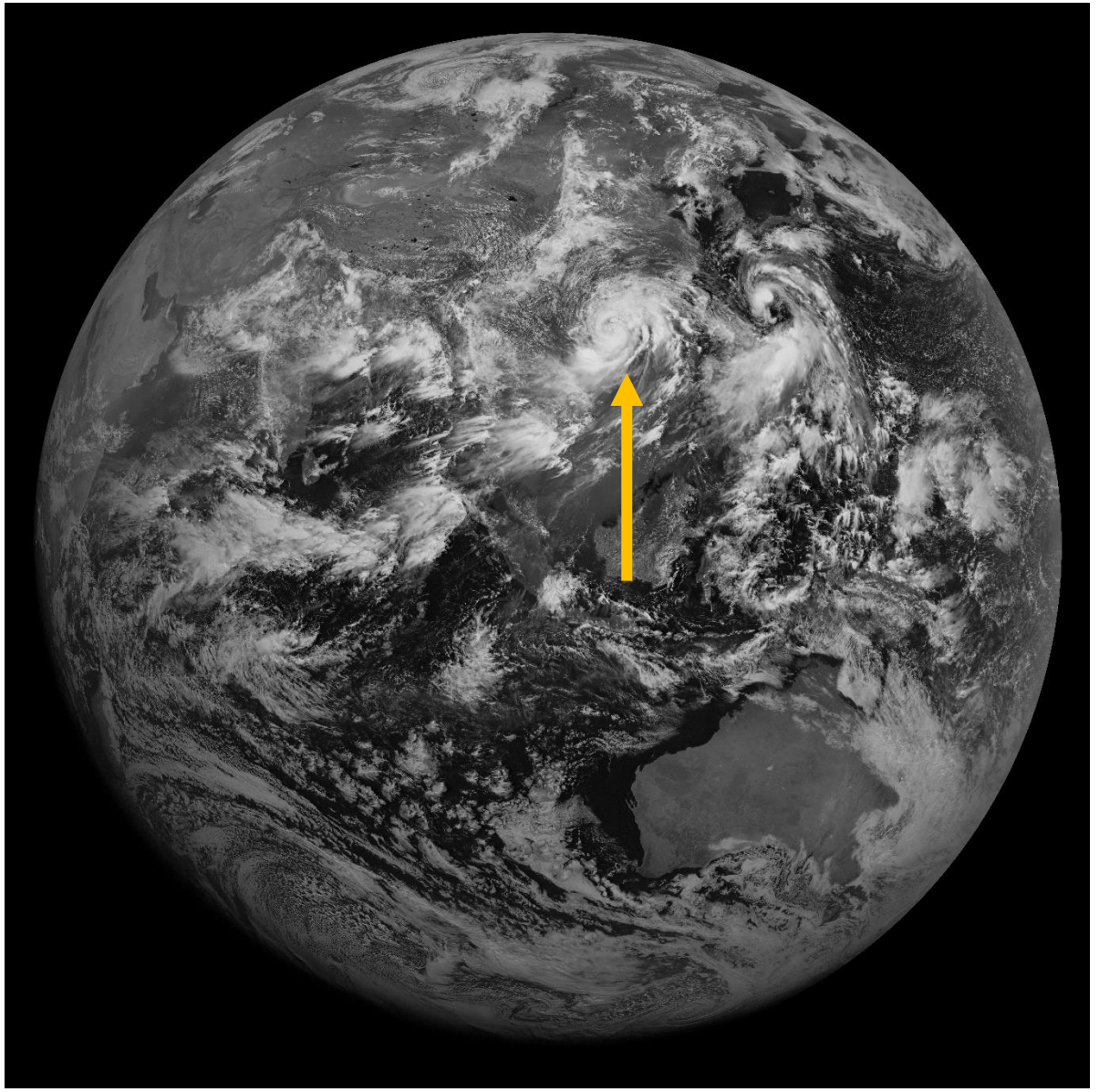
Imagers of FY-2 and FY-4

	FY-2(F/G/H)		FY-4A AGRI		FY-4B AGRI		
Channel	Band	Spatial Resolution	Band	Spatial Resolution	Band	Spatial Resolution	Main Application
Visible & Near-Infrared			0.45～0.49	1	0.45～0.49	1	Aerosol
	0.55～0.75	1.25	0.55～0.75	0.5～1	0.55～0.75	0.5～1	Fog, Clound
			0.75～0.90	1	0.75～0.90	1	Vegetation
Short-wave Infrared			1.36～1.39	2	1.36～1.39	2	Cirrus
			1.58～1.64	2	1.58～1.64	2	Cloud,Snow
			2.1～2.35	2～4	2.1～2.35	2～4	Cirrus,Aerosol
Mid-wave Infrared			3.5～4.0(High)	2	3.5～4.0(High)	2	Fire
	3.5～4.0	5	3.5～4.0(Low) *	4	3.5～4.0(Low) *	4	Land surface
Water Vapor			5.8～6.7	4	5.8～6.7	4	WV
	6.3～7.6	5	6.9～7.3	4	6.9～7.3	4	WV
					7.24~7.6	4	WV
Long-wave Infrared			8.0～9.0*	4	8.0～9.0*	4	WV,Cloud
	10.3～11.3	5	10.3～11.3*	4	10.3～11.3*	4	SST
	11.5～12.5	5	11.5～12.5*	4	11.5～12.5*	4	SST
			13.2～13.8*	4	13.2～13.8*	4	CTH

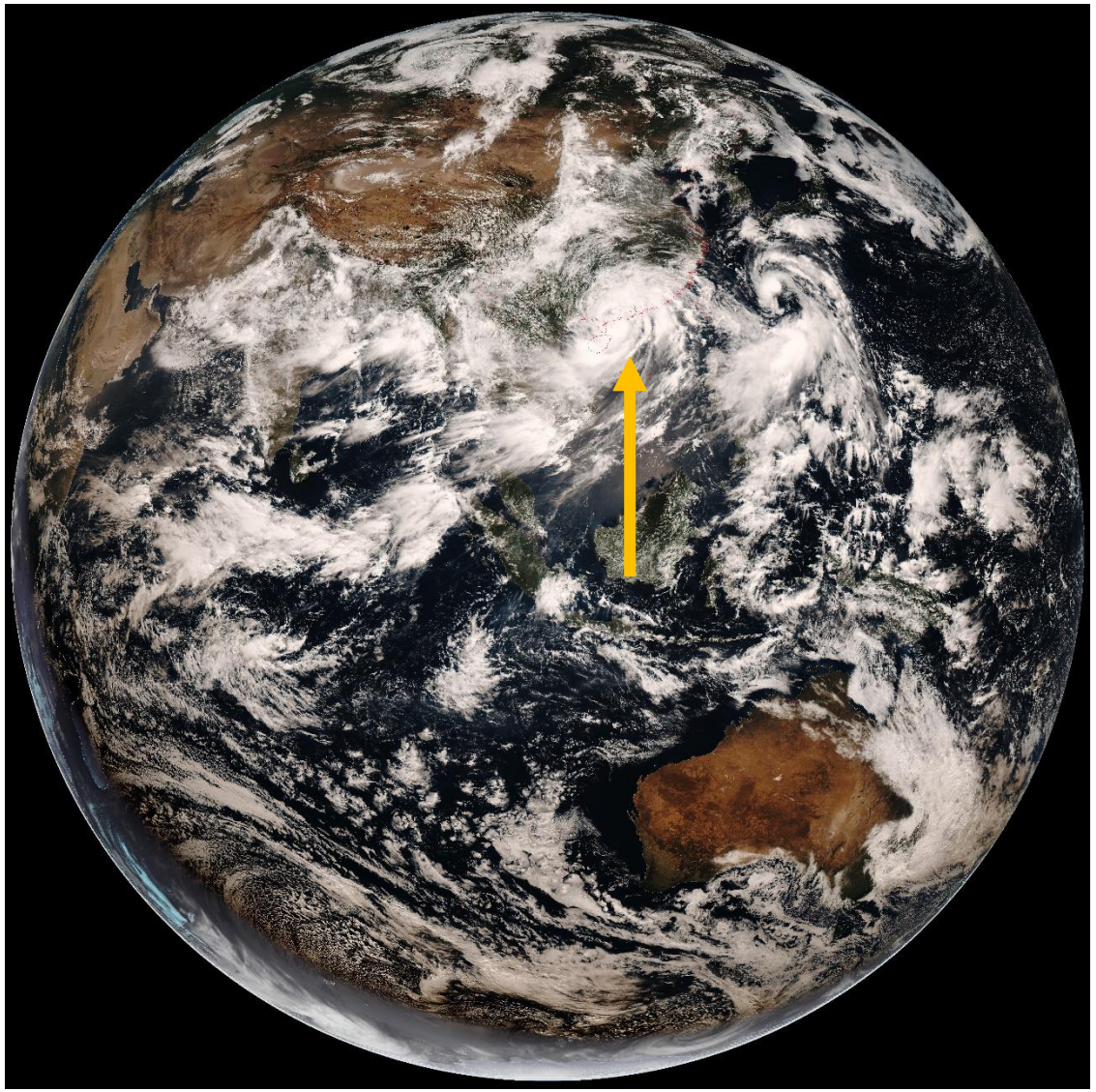
Different Positions

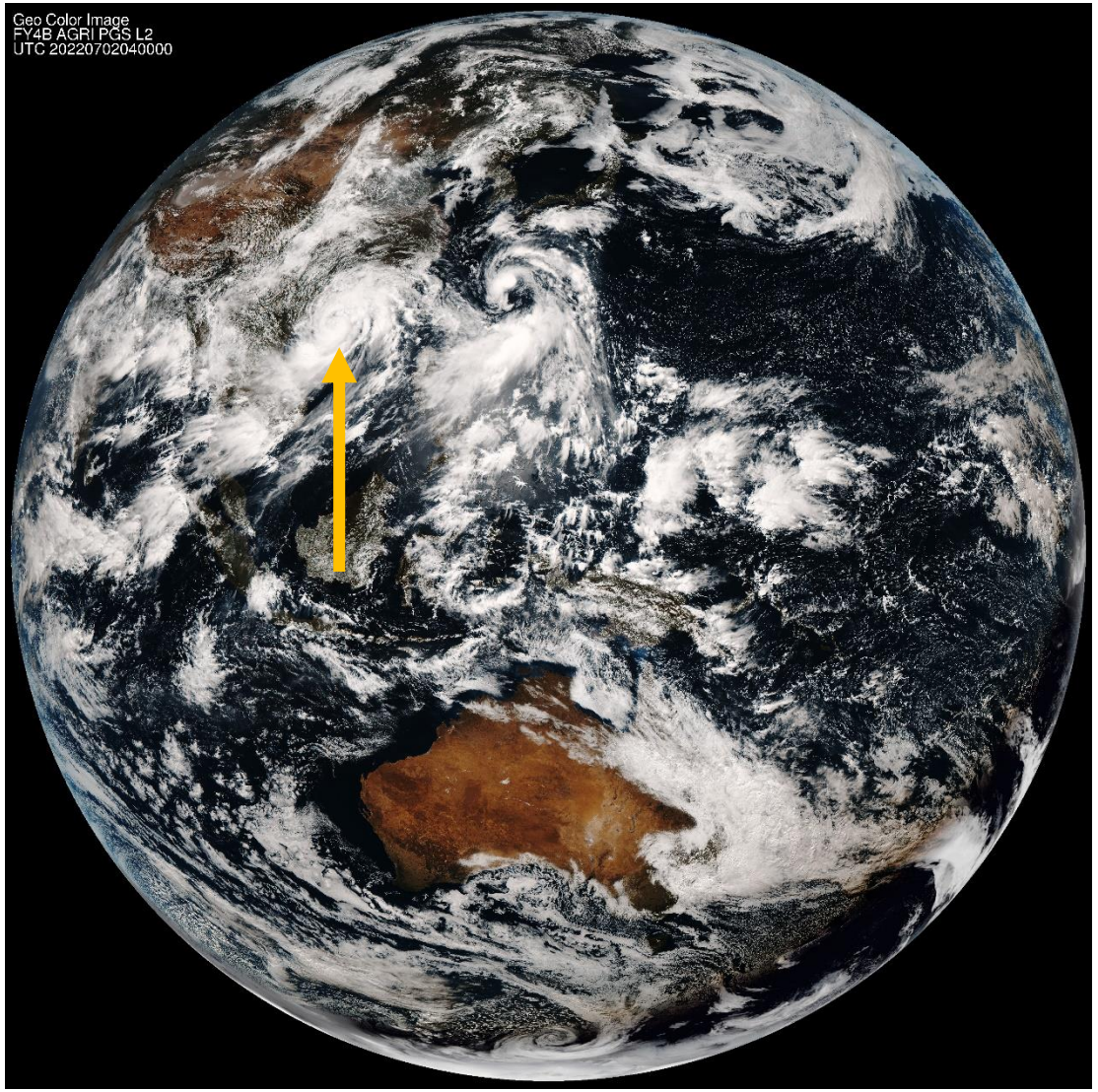


FY-2H (79° E)



FY-2G (105° E)

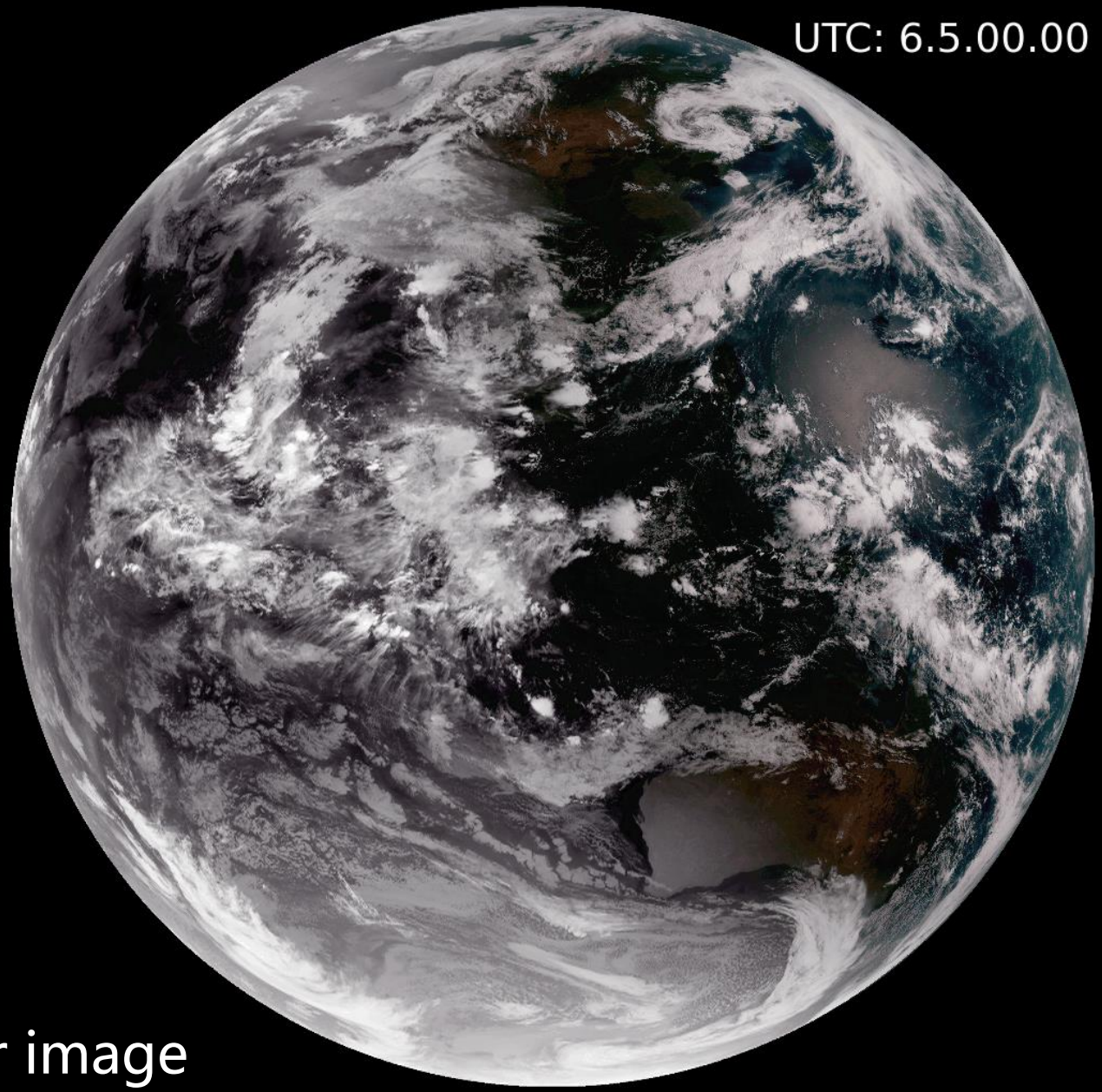




FY-4A (105° E)

2022.07.02 02:00UTC

FY-4B (133° E)



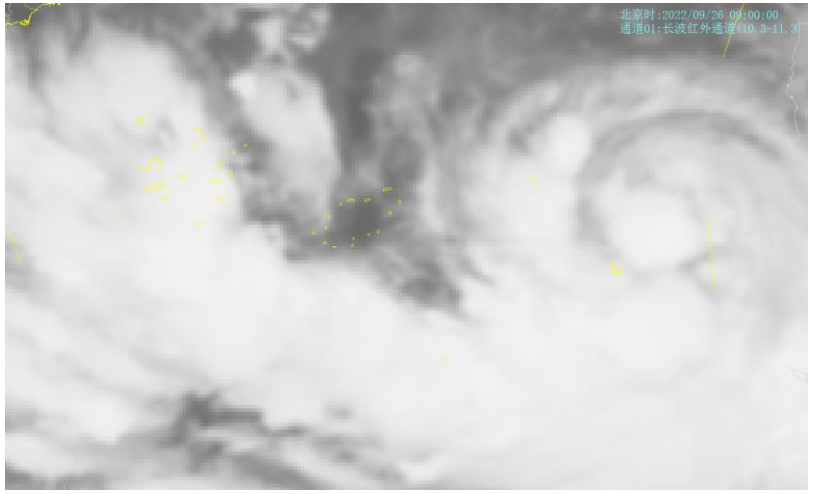
FY-4A true color image

Features:

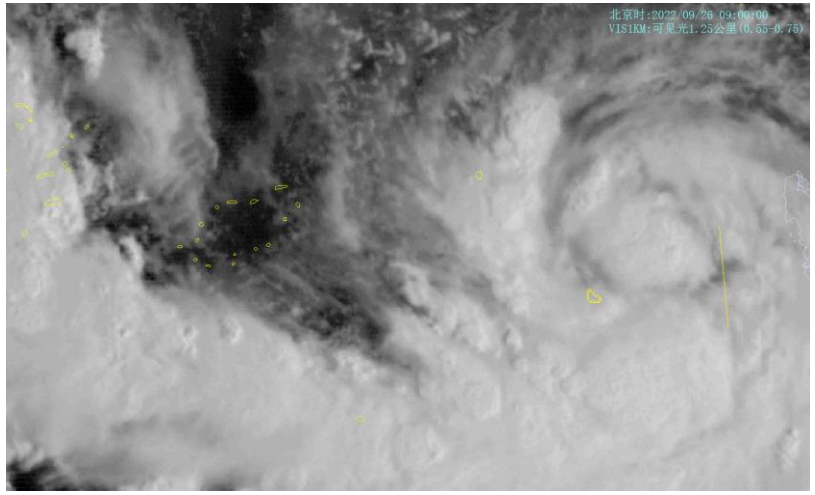
1. Orbit height is about 35800 km, fixed observation area
2. Two modes:
   - Full-disk (15m)
   - Area (5m)

Geostationary satellites Update- Geostationary High-speed Imager

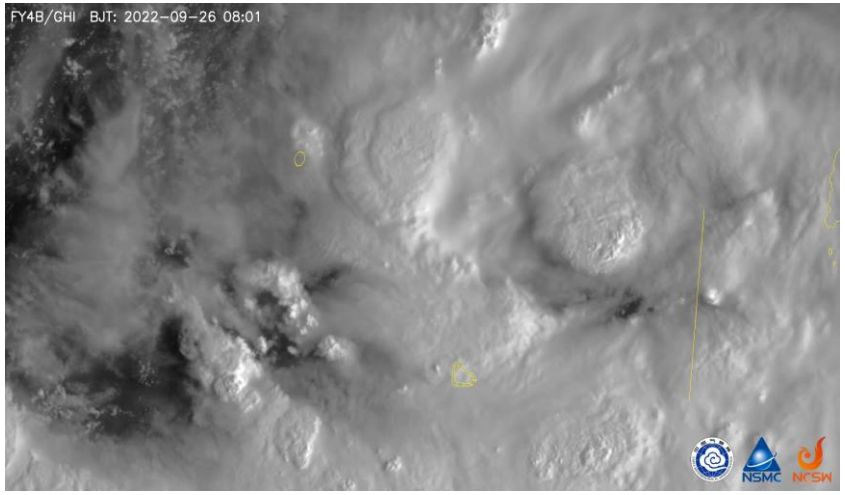
Temporal resolution has increased from 60 minutes to 1 minute



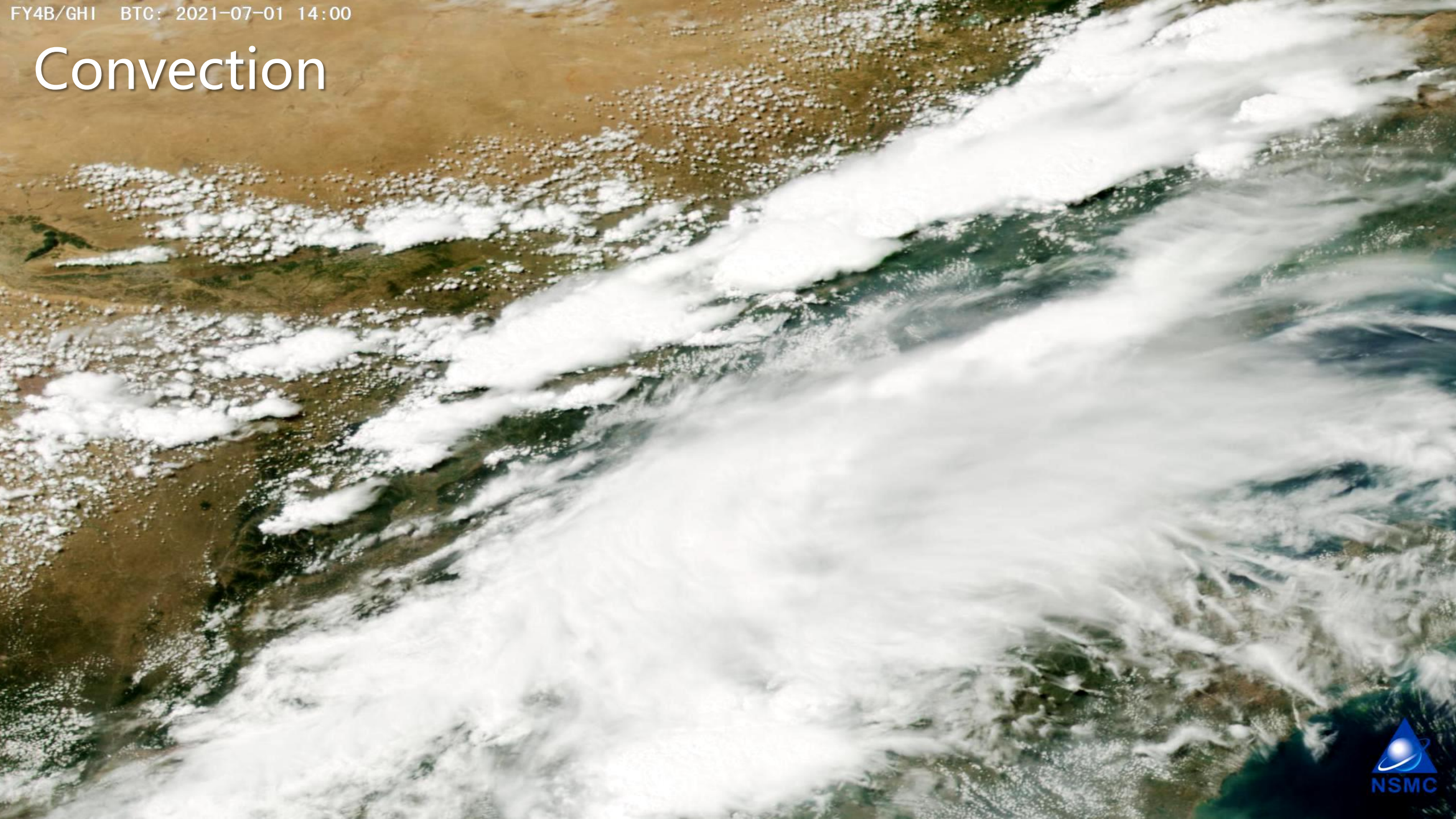
1hour
4km



5min
500m

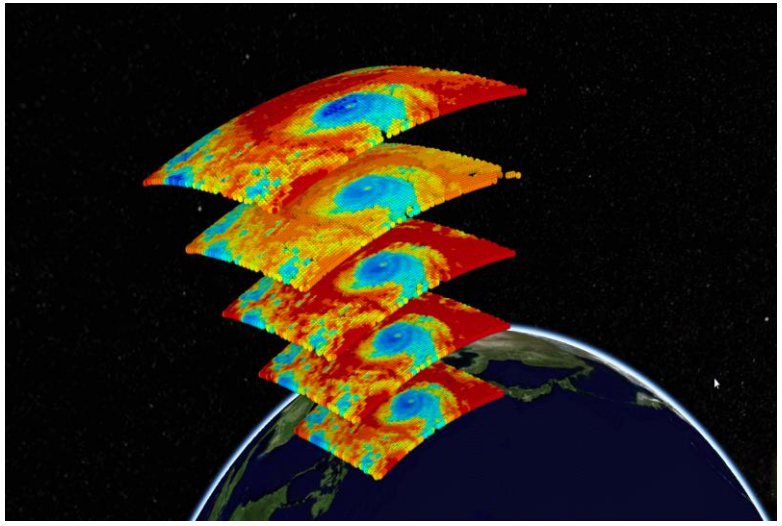


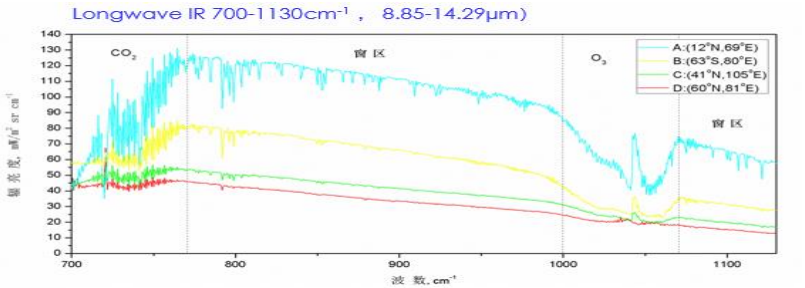
1min
250m


FY4B/GHI BTC: 2021-07-01 14:00
Convection
NSMC

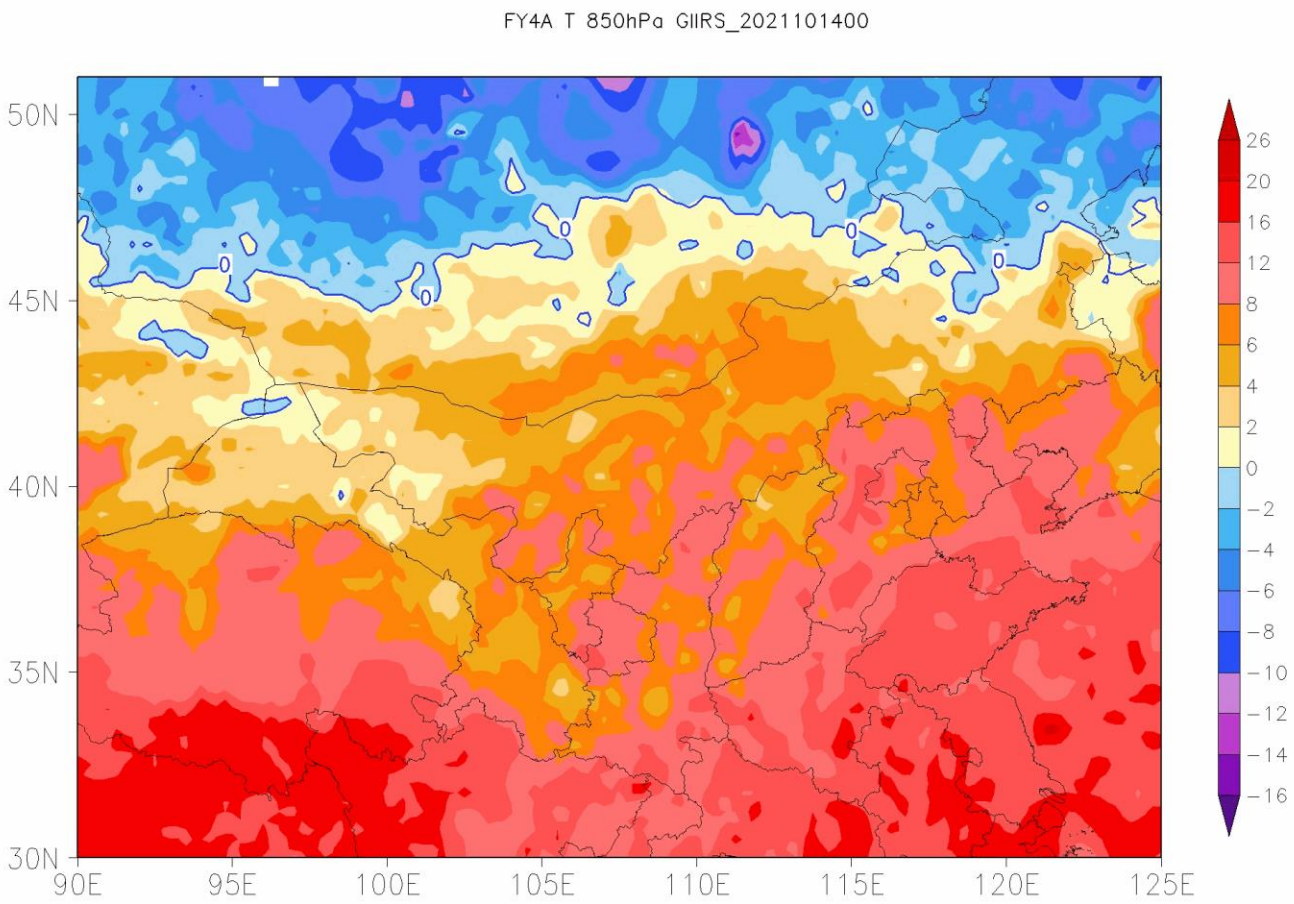
FY-4 Capabilities : Hyperspectral Sounding

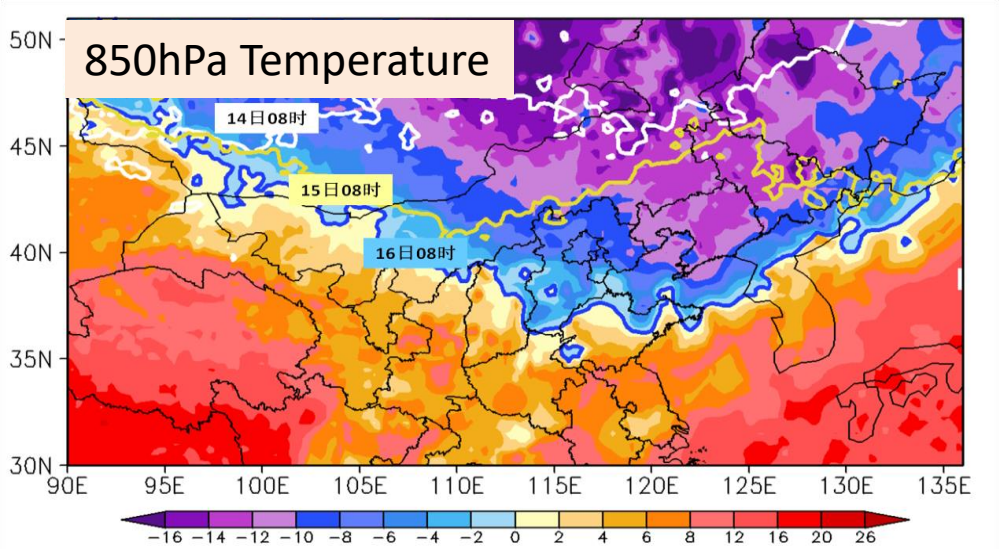
	FY-4A GIIRS	FY-4B GIIRS
Spectral range (cm^{-1})	700 – 1130	680 – 1130
	1650 –2250	1650 –2250
Spectral resolution (cm^{-1})	0.625	0.625
	0.625	0.625
Sensitivity@280K (K)	0.4-0.8	0.4
	0.8-1.2	0.8
Spatial resolution (Km)	16	12-16
Temporal resolution (min)	60Min (5000X5000Km)	45 Min (5000X5000Km)
Status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

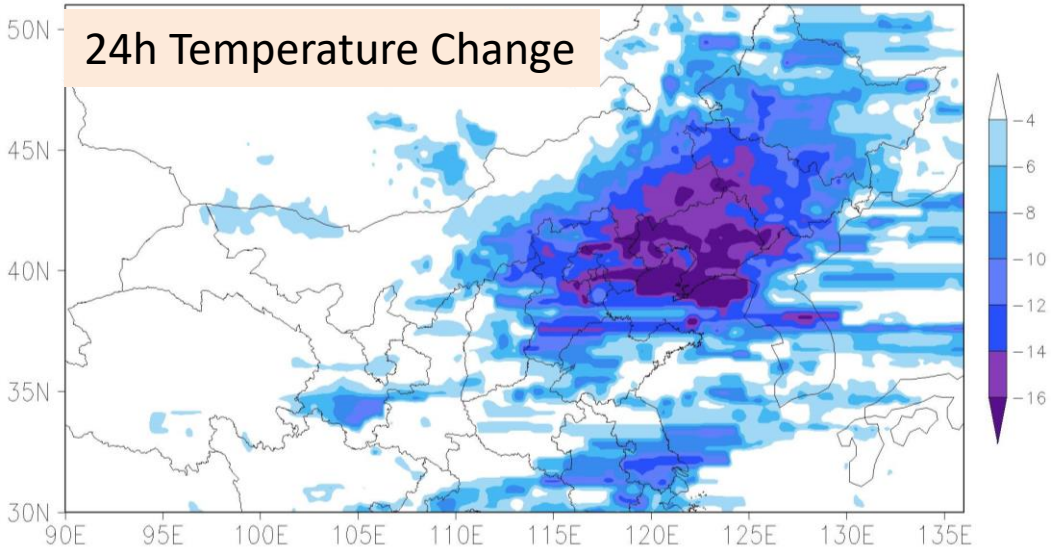




FY4A GIIRS application in a cold wave







NH3 Observation

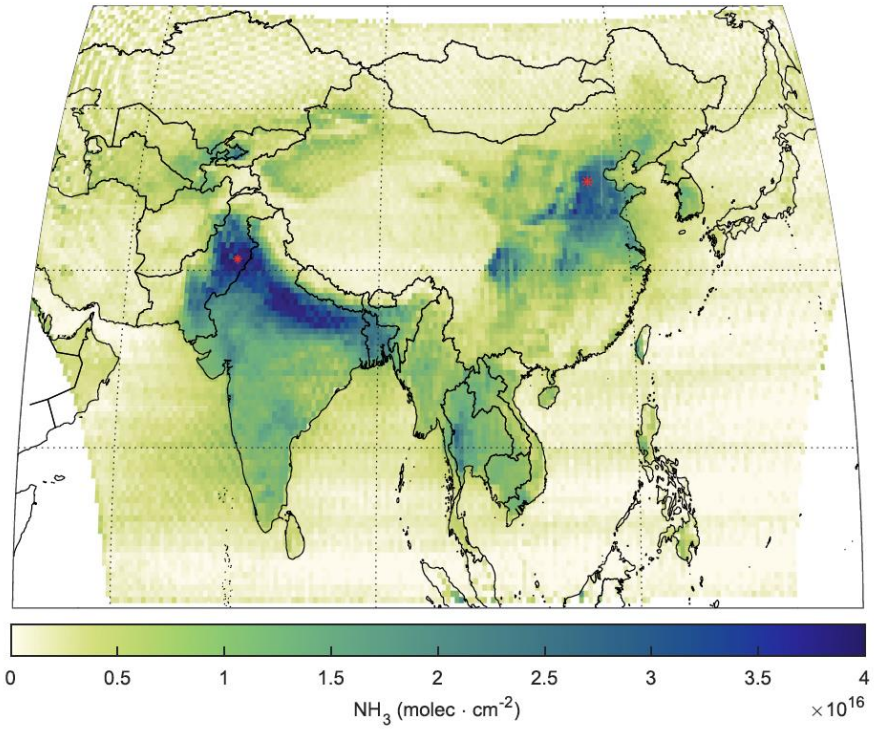
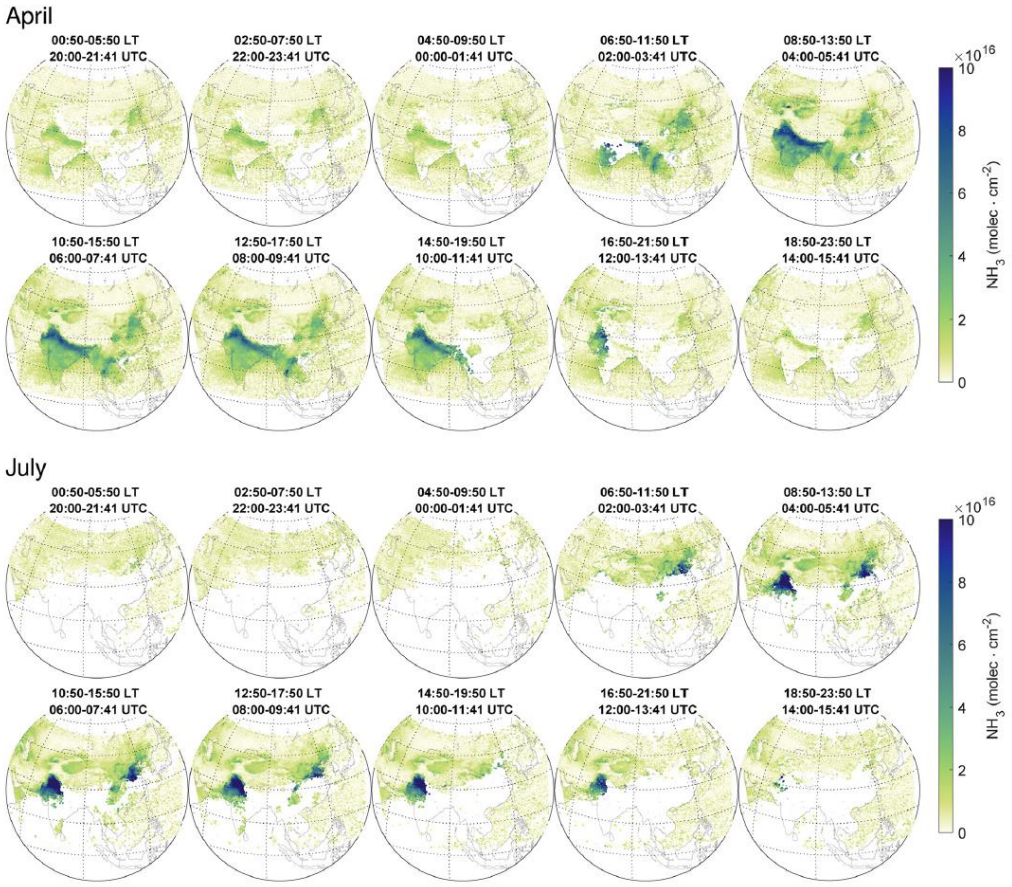
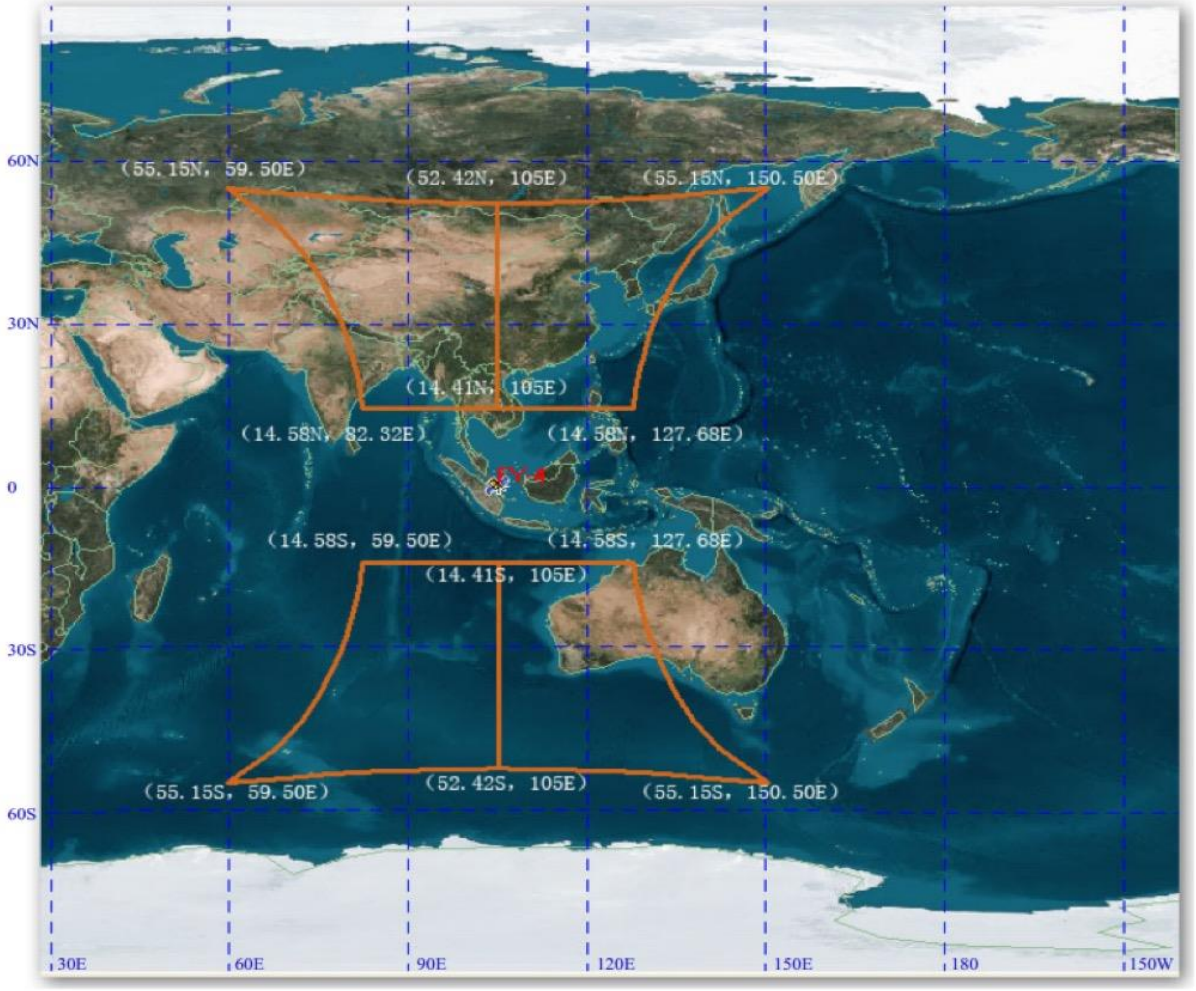


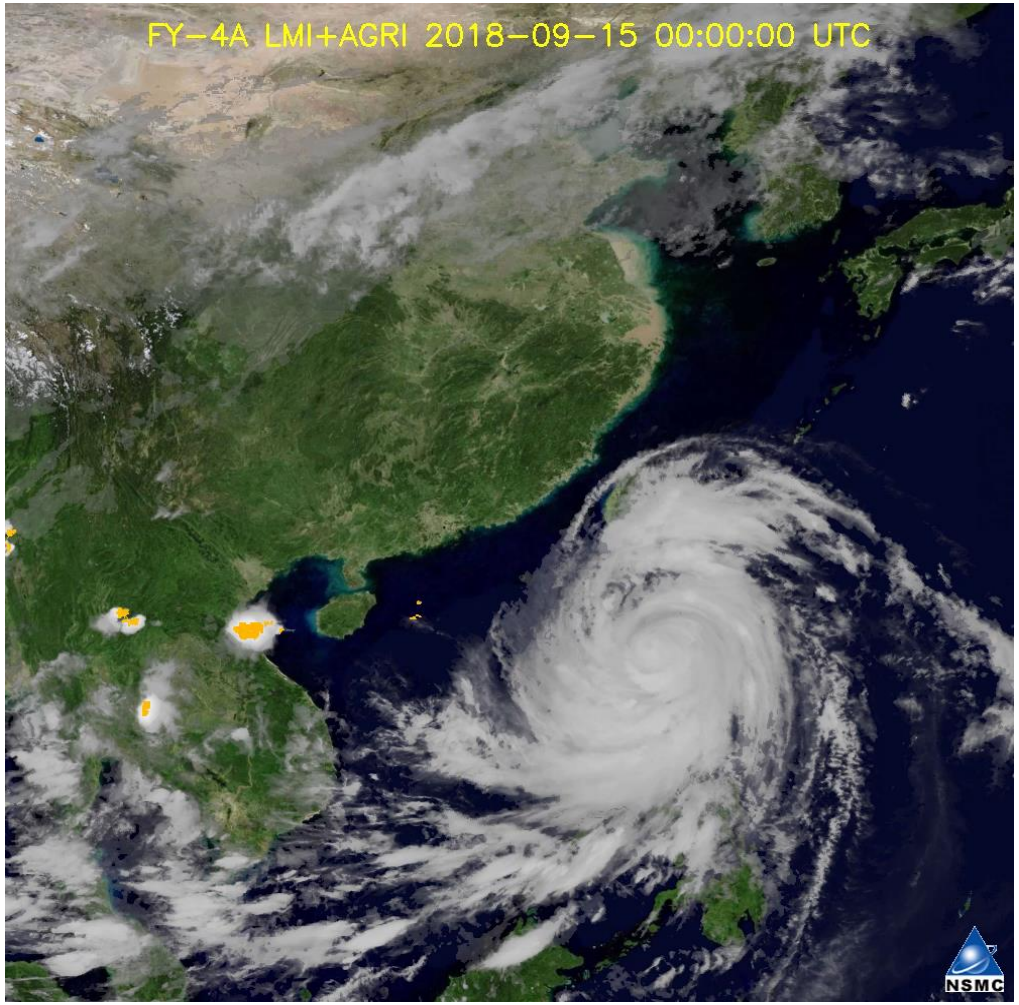
Figure 2. November 2019 to October 2020 average of GIIRS-derived NH_3 columns on a 0.5° × 0.5° grid. Due to the cloud or sensitivity filter (see text), certain periods of the day or year might locally be under/overrepresented in this average. The red stars indicate the locations of the two sites analyzed in Section 4 and Figure 4 (30° N, 73° E for Pakistan and 38° N, 115.5° E for China).



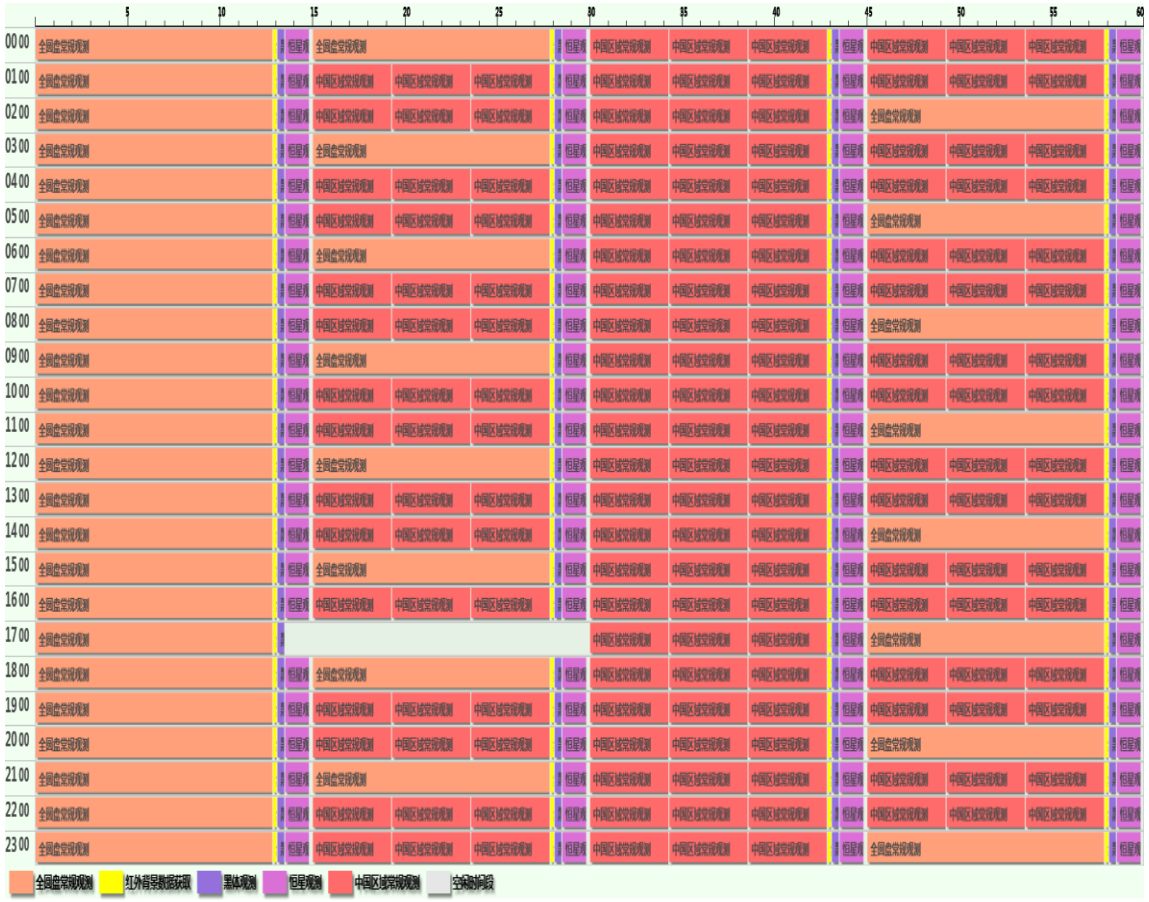
Clarisse, L., Van Damme, M.,Hurtmans, D., Franco, B., Clerbaux,C., & Coheur, P.-F. (2021). The diel cycle of NH3 observed from the FY-4A Geostationary Interferometric Infrared Sounder (GIIRS). Geophysical Research Letters, 48, e2021GL093010. https://doi.org/10.1029/2021GL093010

FY-4 Capabilities: Lightning Imager

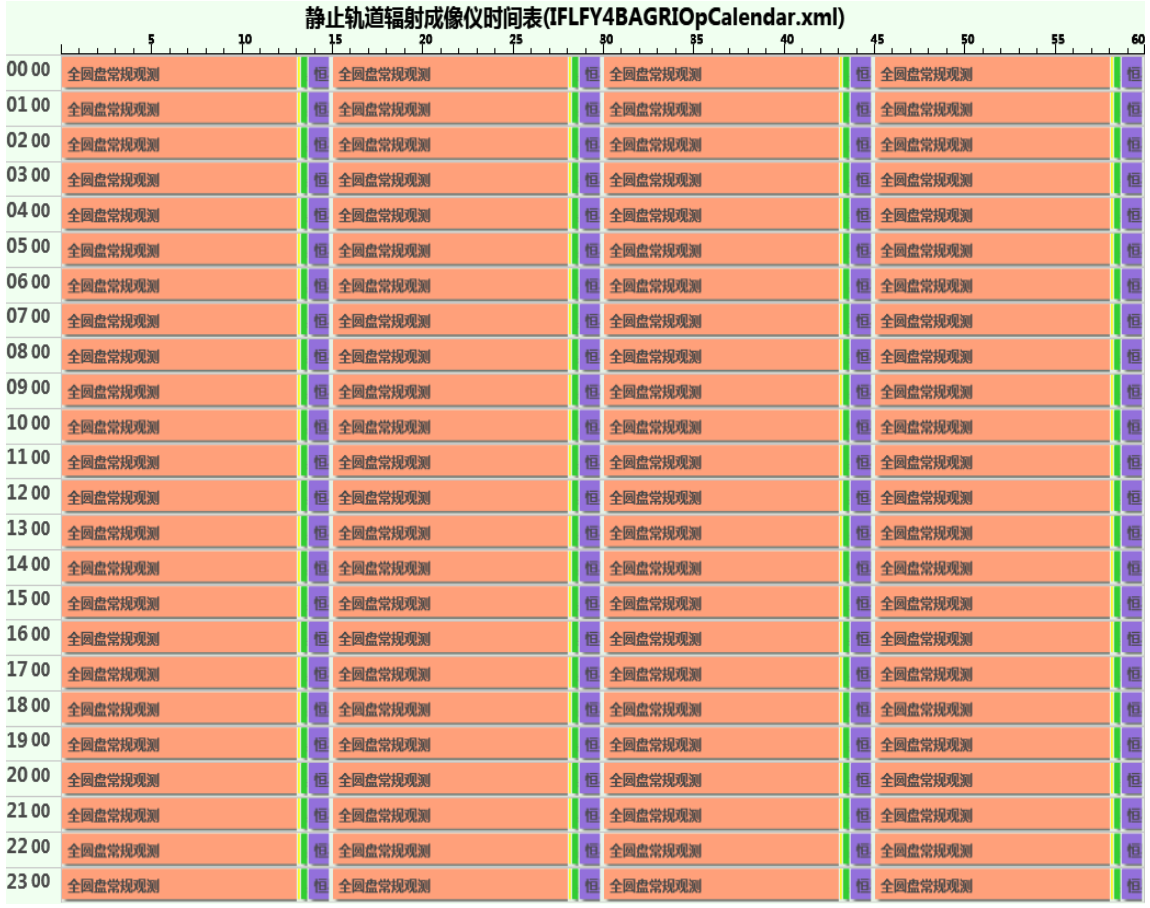




Observation mode of GEO instruments-AGRI

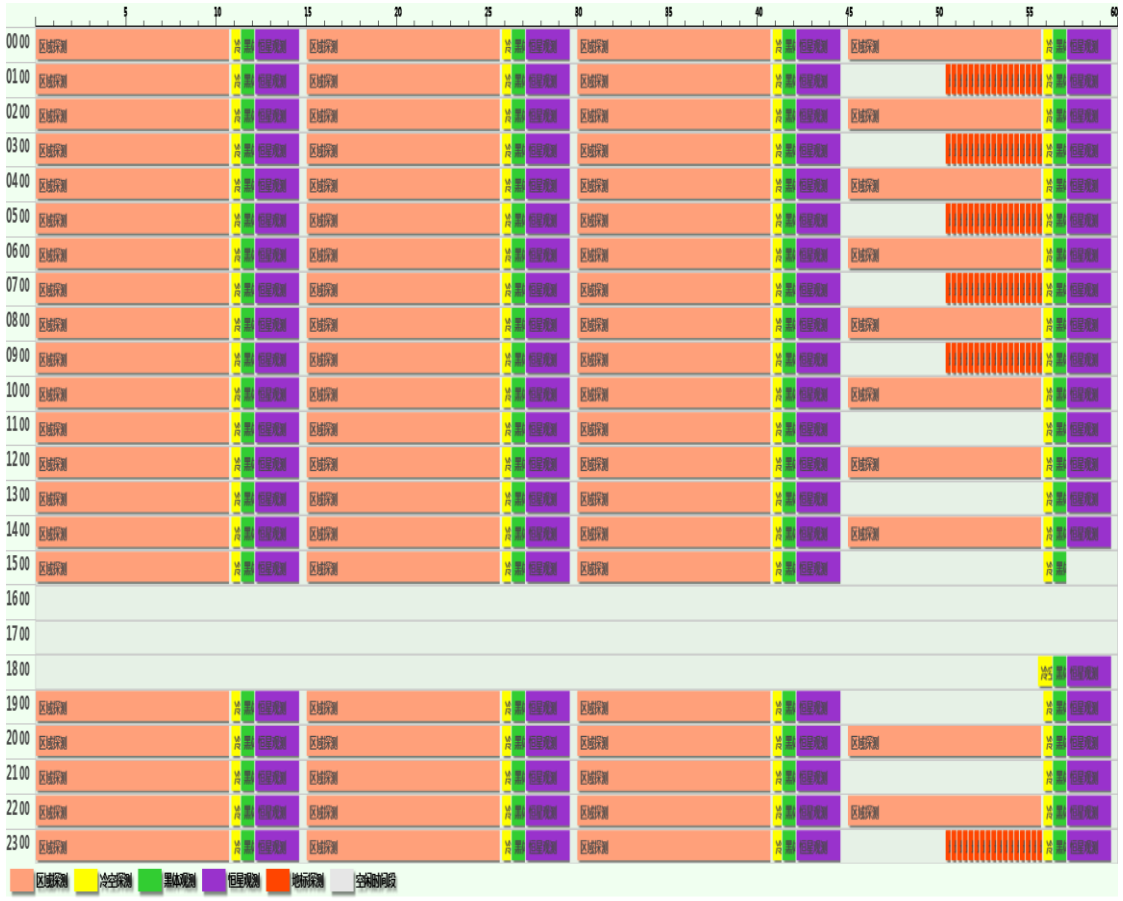


FY4A AGRI observation mode

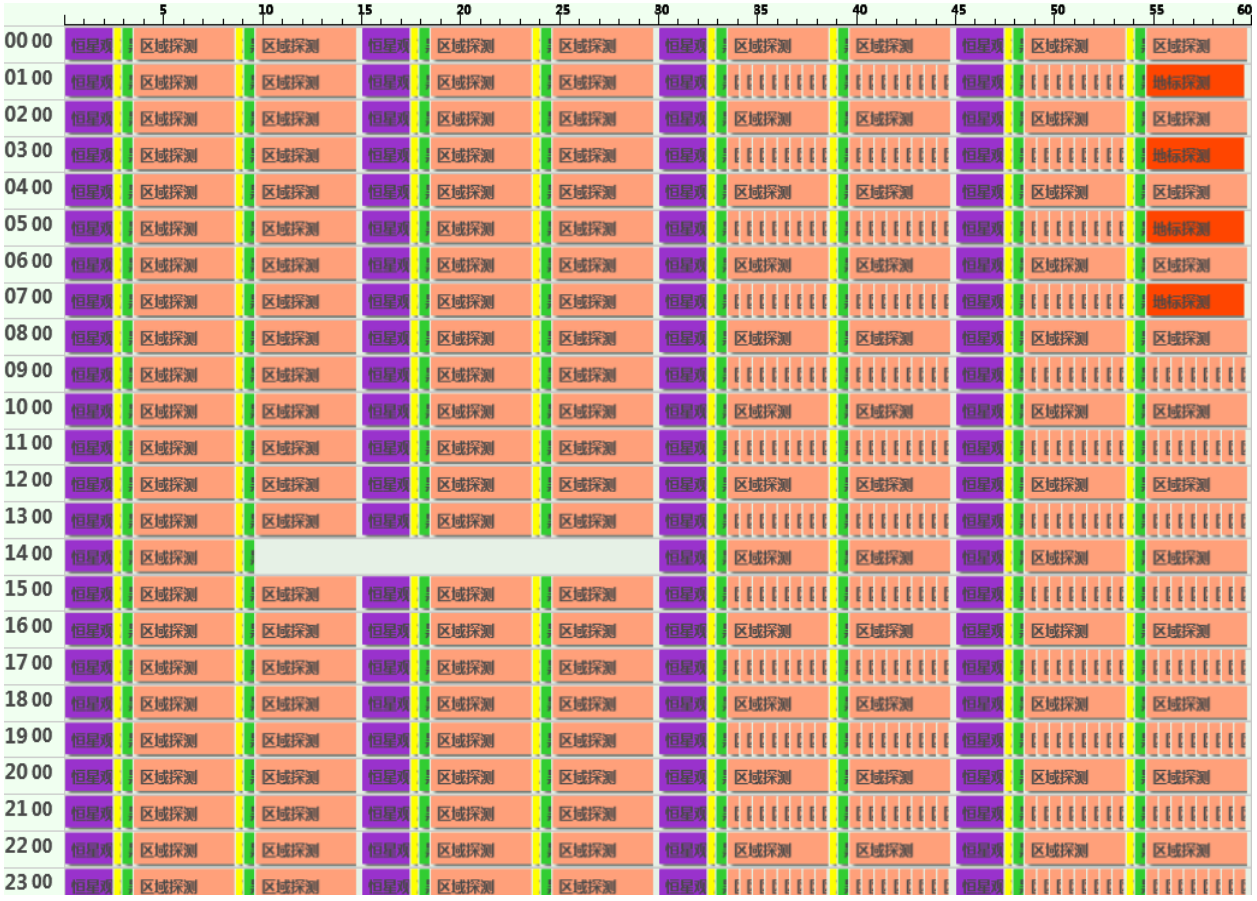


FY4B AGRI observation mode

GIIRS time table

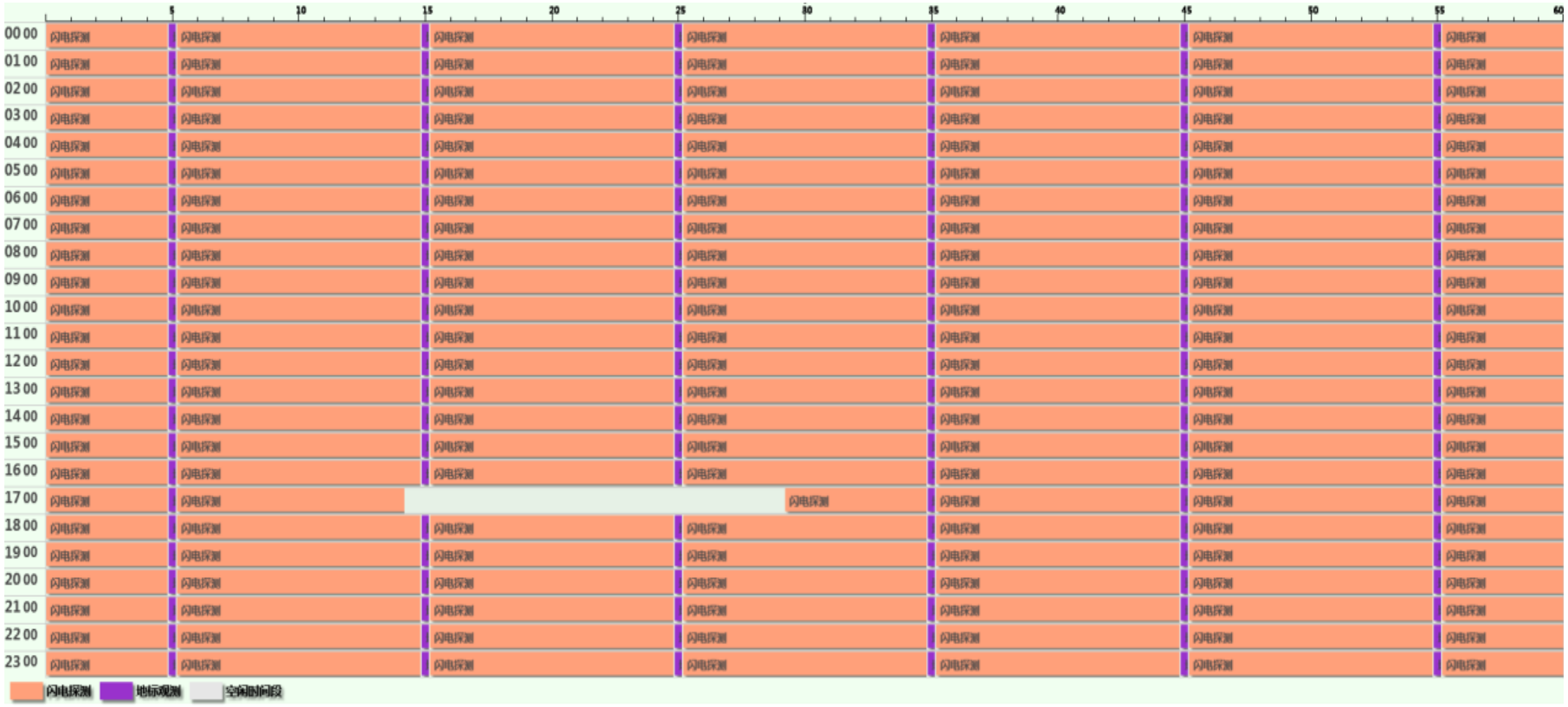


FY4A GIIRS observation mode



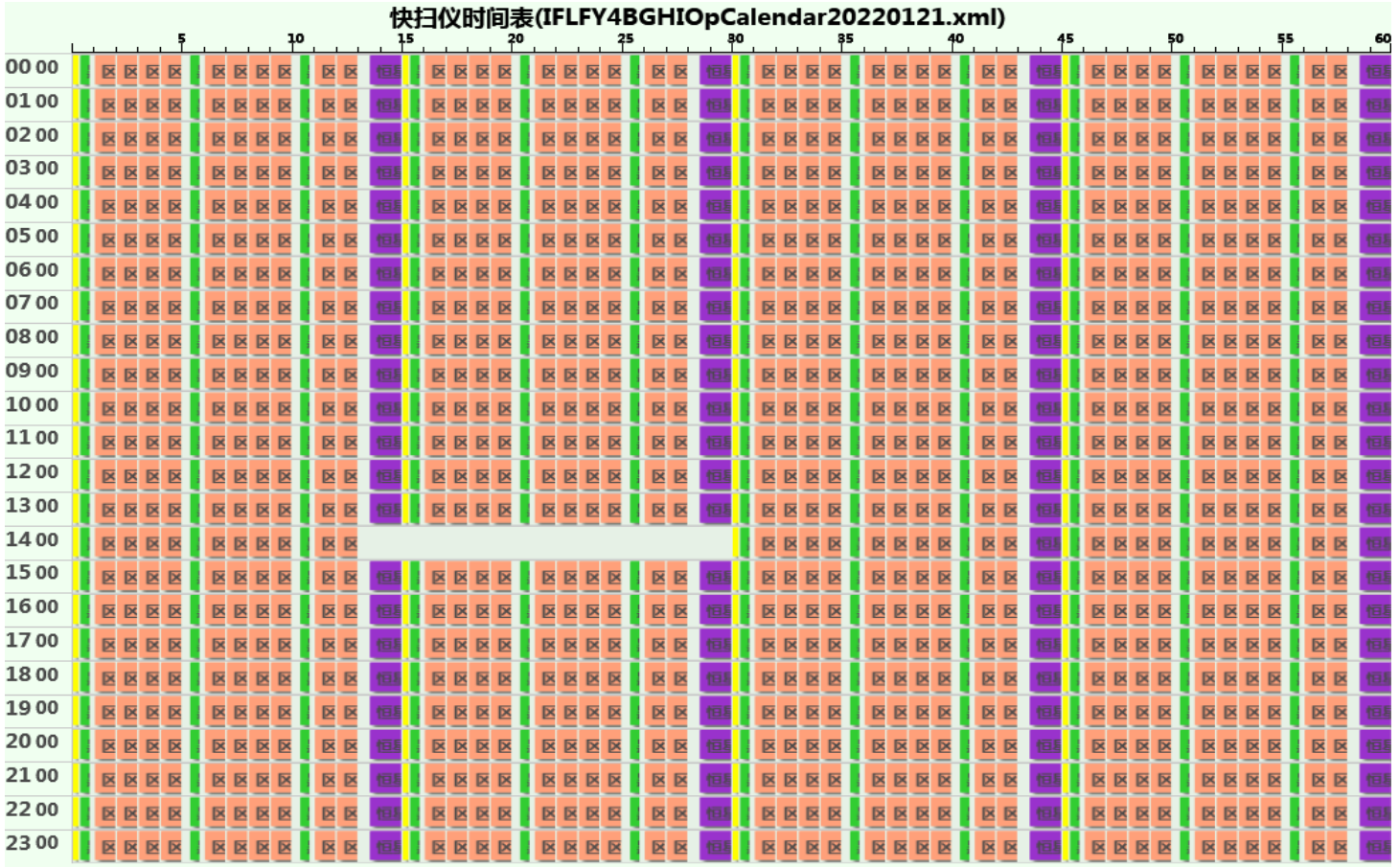
FY4B GIIRS observation mode

LMI time table



FY4A LMI observation mode

GHI time table

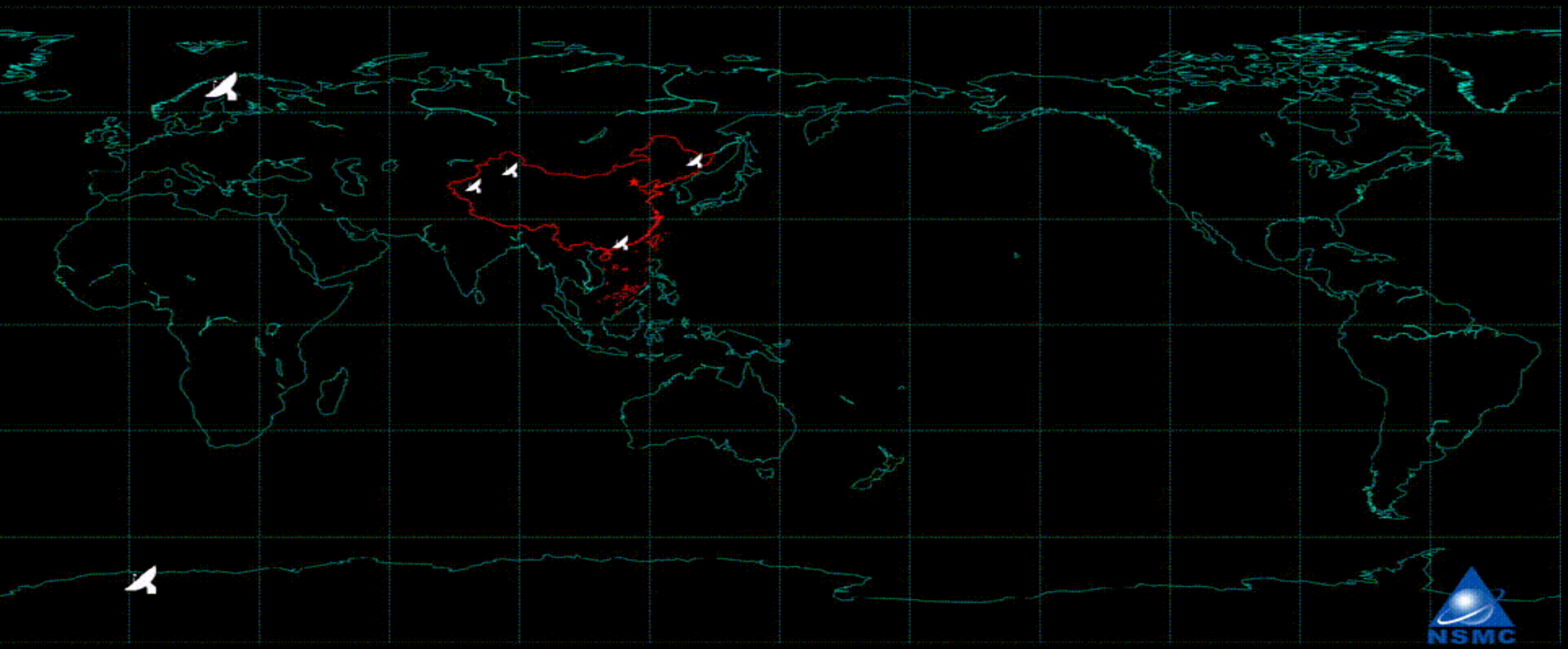


FY4B GHI observation mode

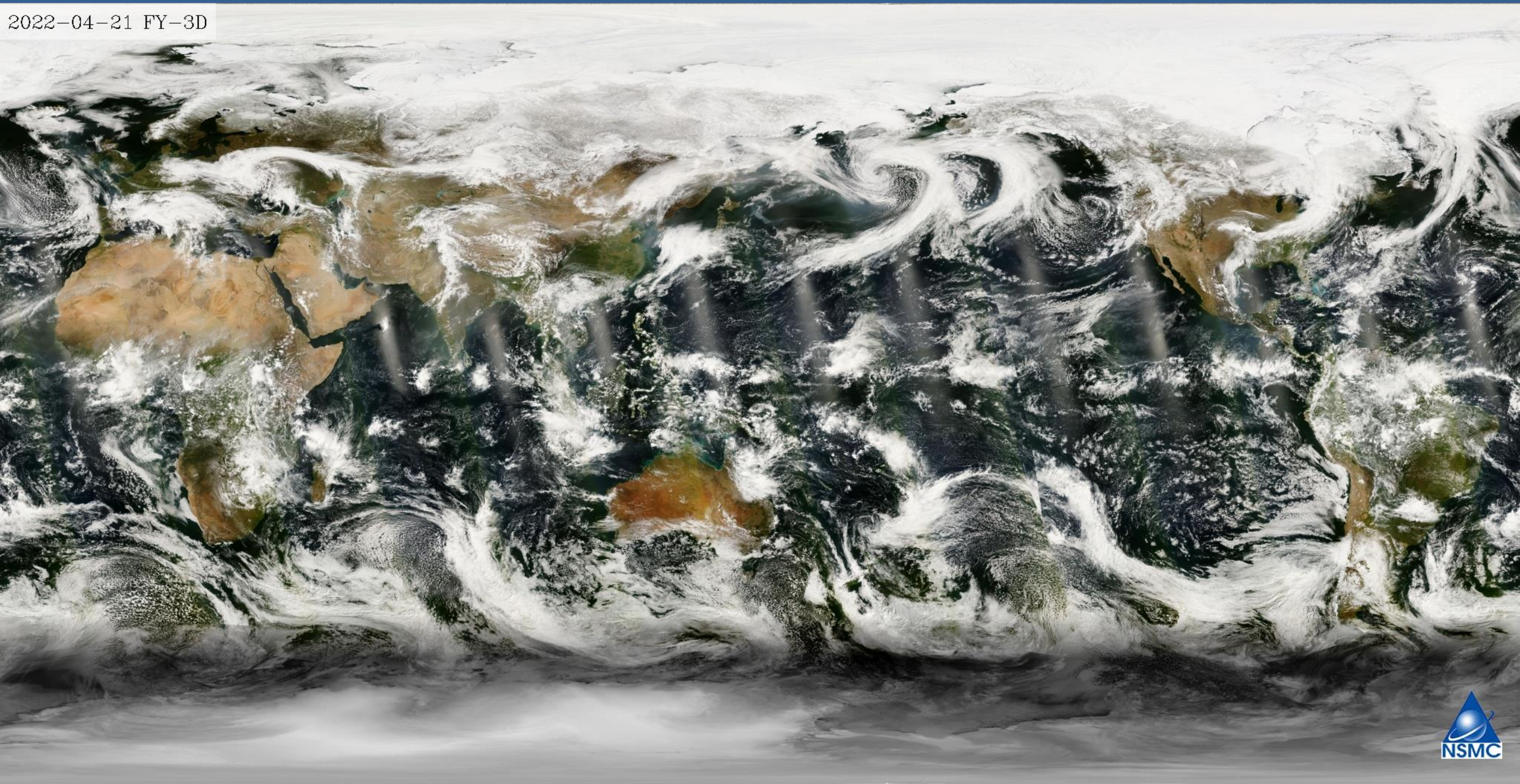
Low Earth Orbit (LEO) satellite constellation

Features:

1. Orbit height is about 800km, orbit period is about 110m
2. Cover earth two times in 24 hours
3. Multiple instruments covers wider spectral bandwidth

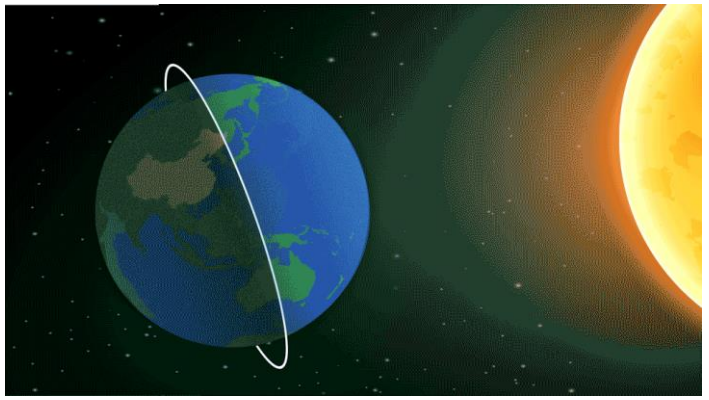


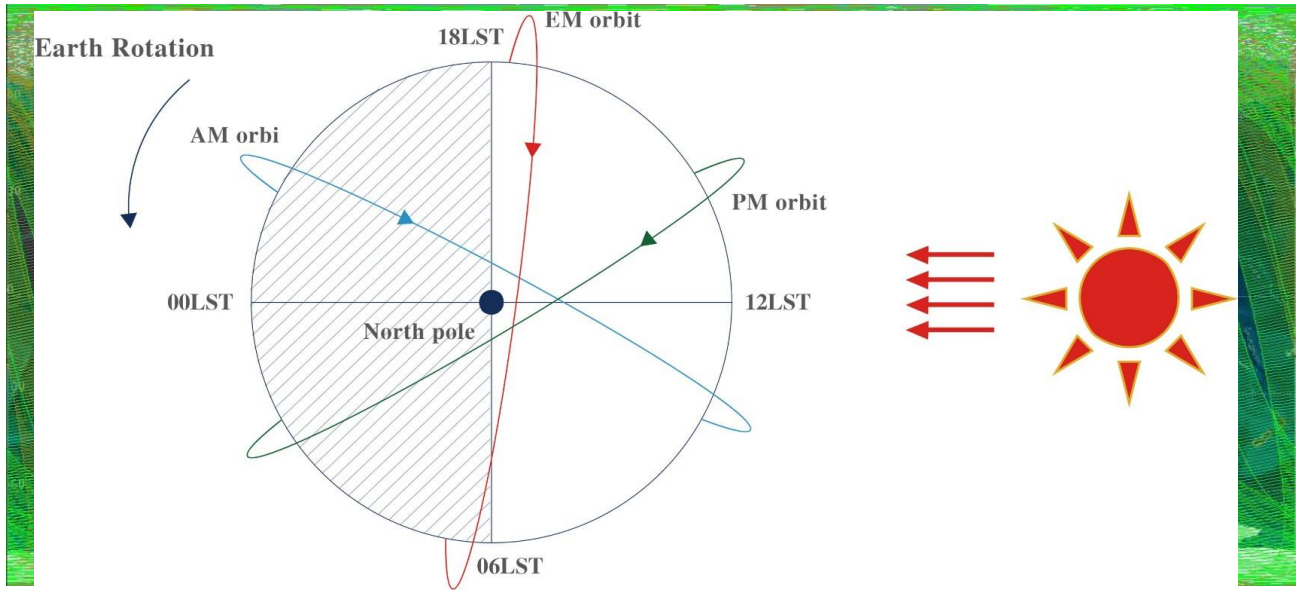
Global observation with FY-3D



FY-3E

- FY-3E is the **first** meteorological satellite **in early morning orbit for civil service**, filling in the observing gap in early morning. It will monitor solar and space environments and their effects, as well as ionospheric data to meet the needs of space weather forecasts and supporting services
- Solar X-ray Extreme Ultraviolet Imager (X-EUVI) is the **first space solar telescope** of China.

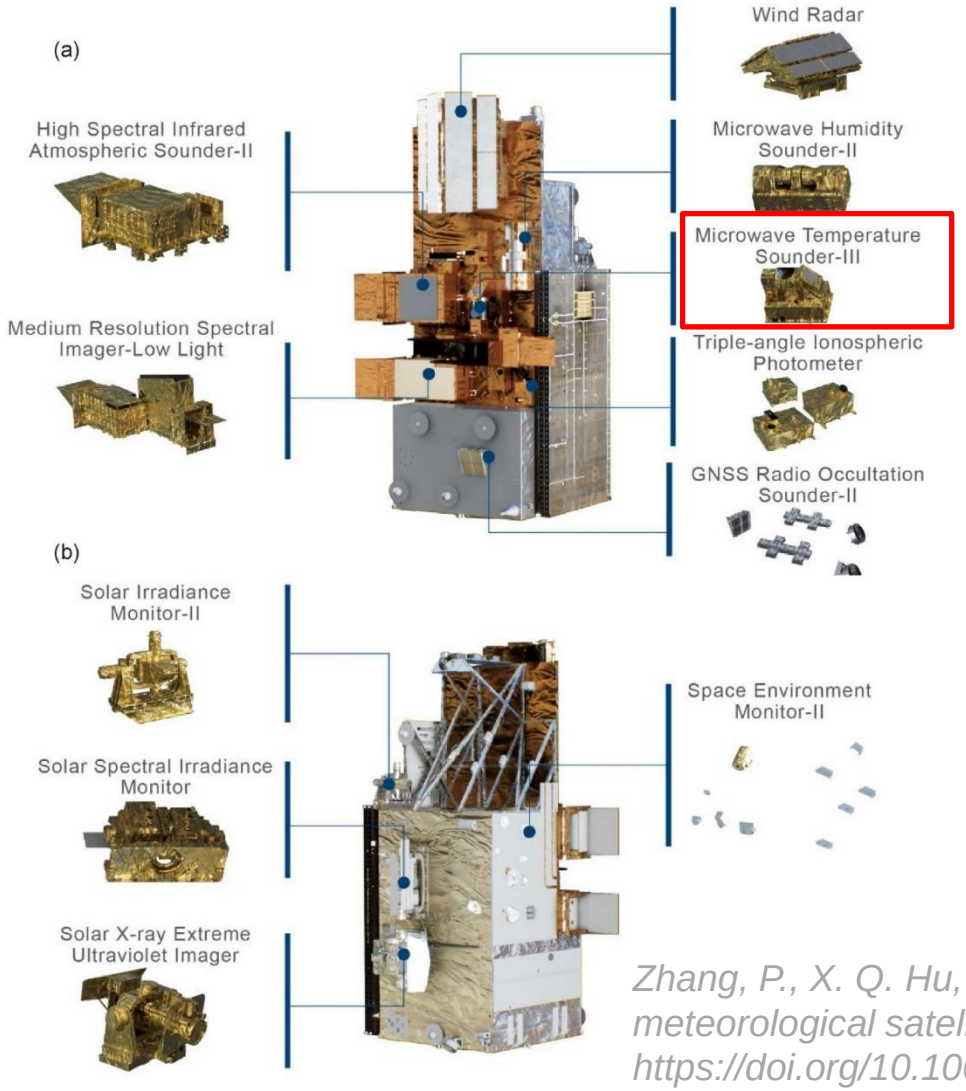




FY-3 Early Morning 6:00 AM | Metop-A 9:30 AM | NPP 13:30 PM

Satellite Payload

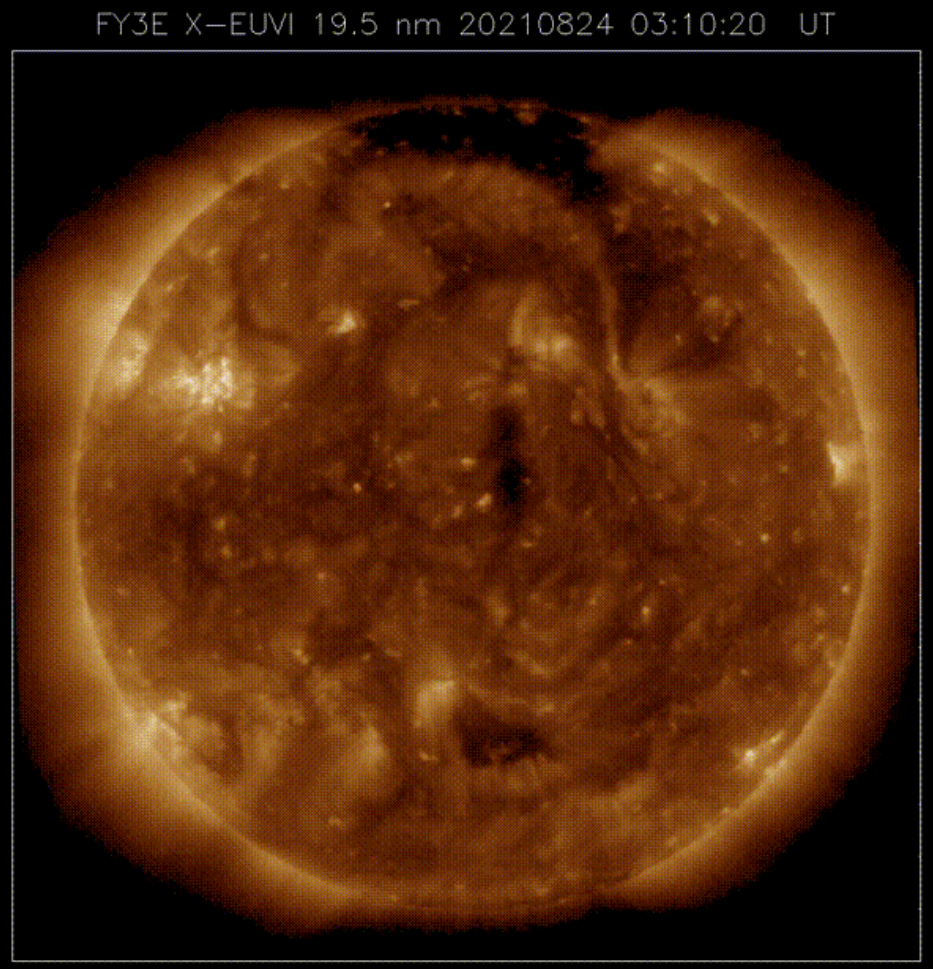
Acronym	Full name
GNOS-2	GNSS Radio Occultation Sounder -2
HIRAS-2	Hyper-spectral Infrared Atmospheric Sounder -2
MERSI-LL	Medium Resolution Spectral Imager -LL
MWHS-2	Micro-Wave Humidity Sounder -2
MWTS-3	Micro-Wave Temperature Sounder -3
SIM-2	Solar Irradiance Monitor - 2
SSIM	Solar Spectral Irradiance Monitor
SWS/Tri-IPM	SWS / Triple-angle Ionospheric PhotoMeter
SES/SEM	SES / SEM(FY-3E)
WindRAD	Wind Radar
XEUVI	Solar X-ray and Extreme Ultraviolet Imager



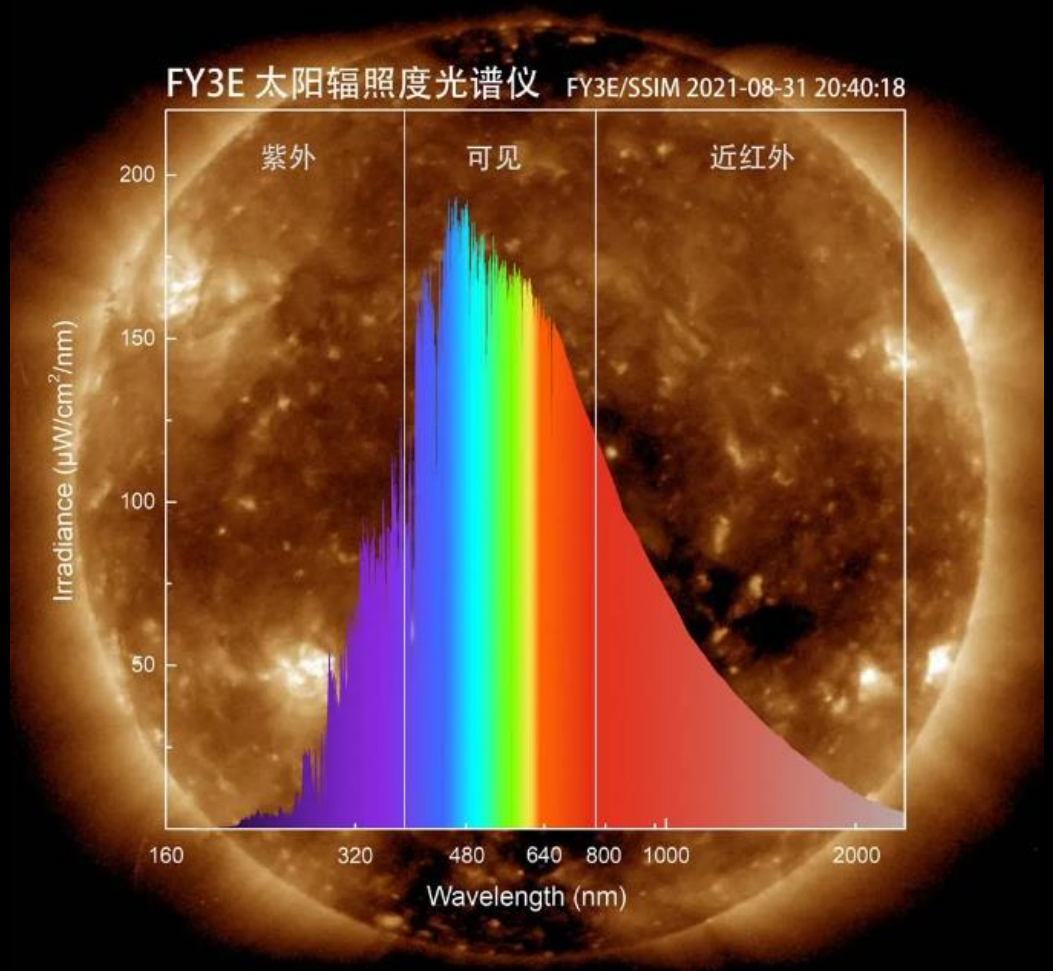
Compared with FY-3D, the MWTS on FY-3E improved detection capabilities and performance indicators. The 13 channels set in the original 50~60GHz frequency band have been increased to 17 channels, including the addition of the 23.8GHz water vapor column total measurement channel, the 31.4GHz window channel, and the 53.246 channel for tropospheric temperature detection at 4 km and 6 km altitude. ±0.08GHz and 53.948±0.081GHz channels

Parameters	FY-3E MWTS	FY-3D MWTS
Ground scanning angle	±53.35°±0.2°	±49.5° ±0.2°
beam width	2.2°（@53.596GHz）	2.2° （@53.596GHz）
On-Board Blackbody	two	two
Scan points	98个	90个
Quantization level	14 bits	13 bits

Zhang, P., X. Q. Hu, Q. F. Lu, A. J. Zhu, M. Y. Lin, L. Sun, L. Chen, and N. Xu, 2022: FY-3E: The first operational meteorological satellite mission in an early morning orbit. Adv. Atmos. Sci., 39(1), 1−8, https://doi.org/10.1007/s00376-021-1304-7

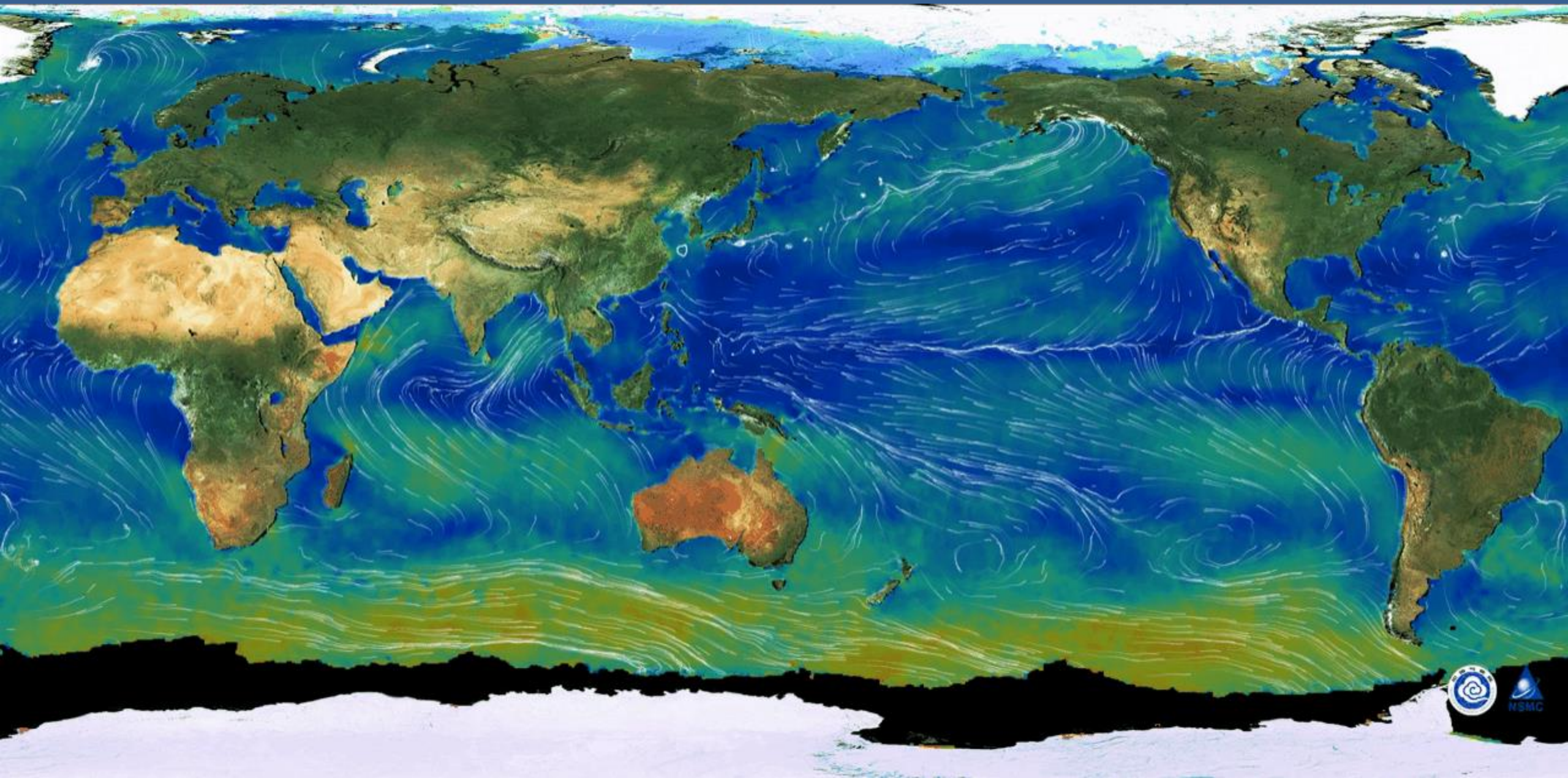


EUV animation of the sun captured by FY-3E satellite

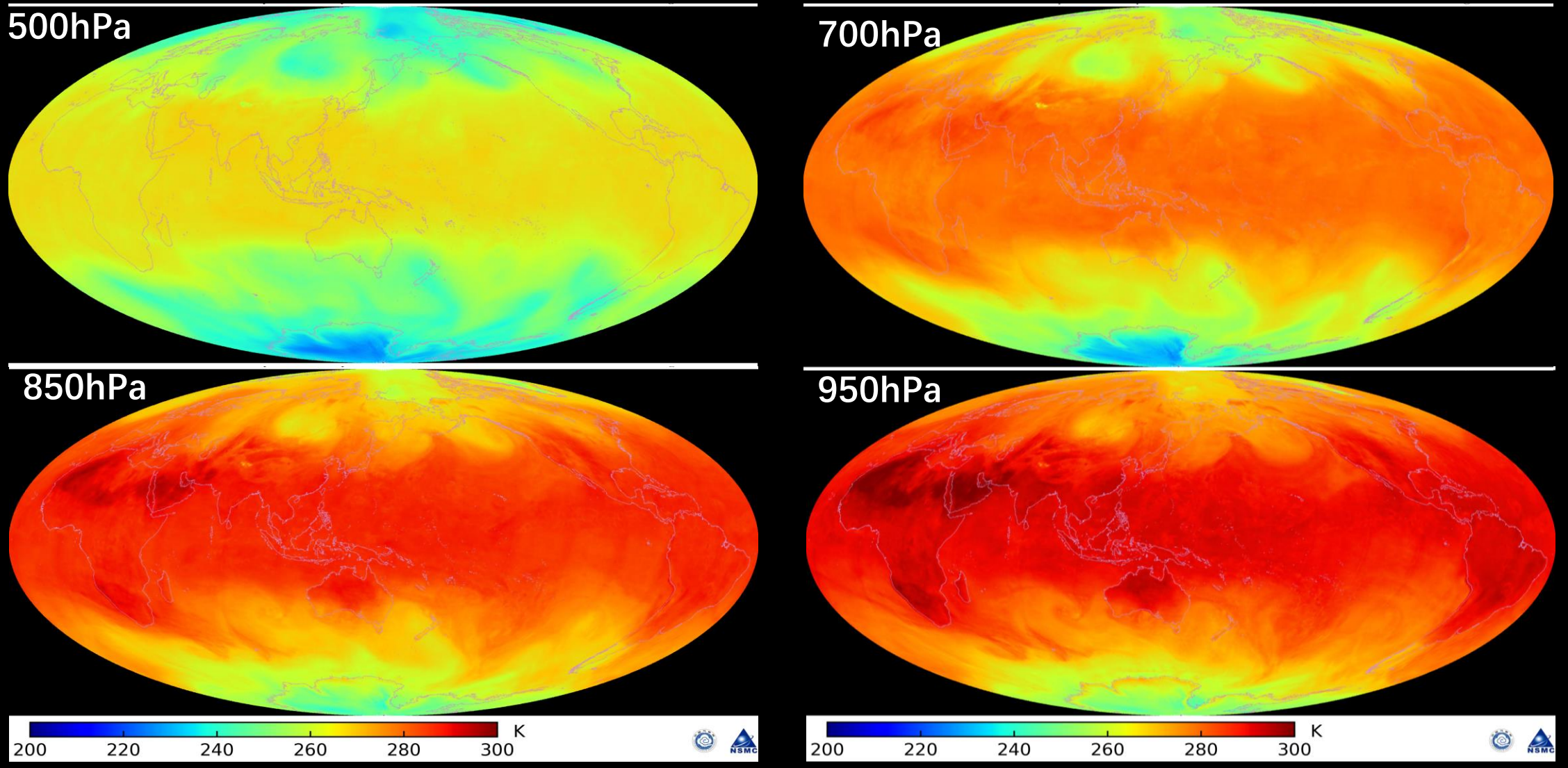


Refined structure of solar captured by FY-3E satellite

FY-3E Monthly Mean Ocean Wind Vector Products (September 2021)

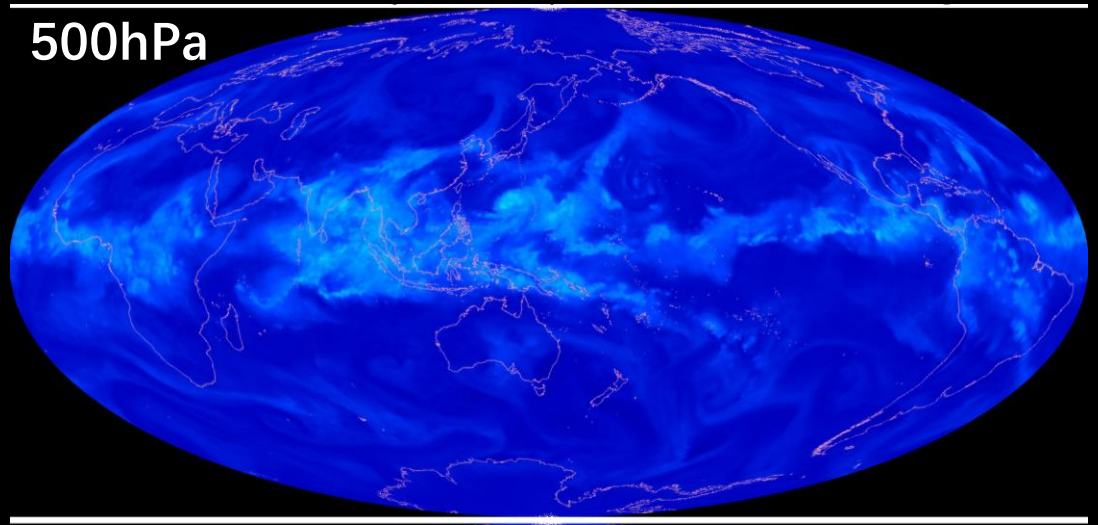


FY-3E global temperature image

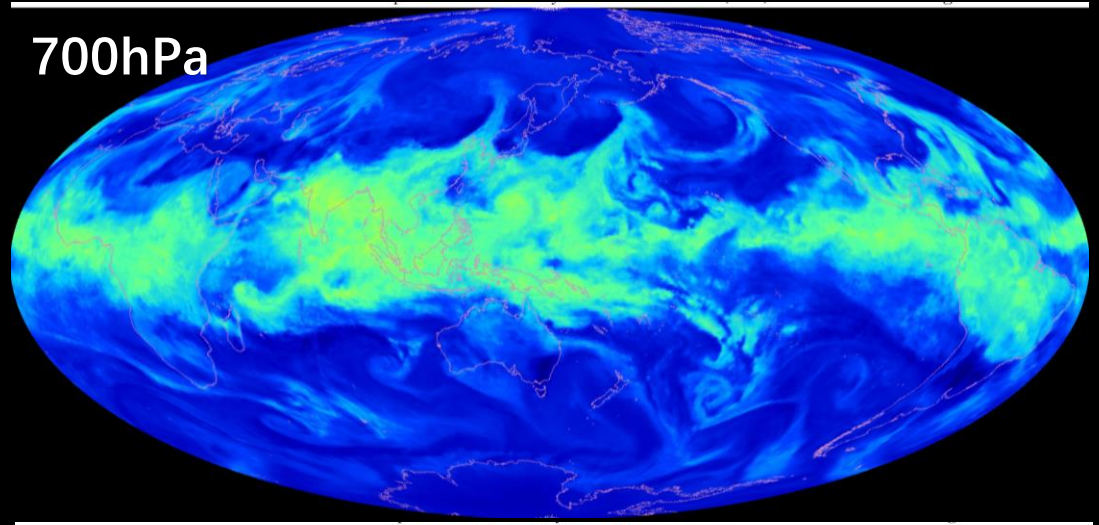


FY-3E global humidity image

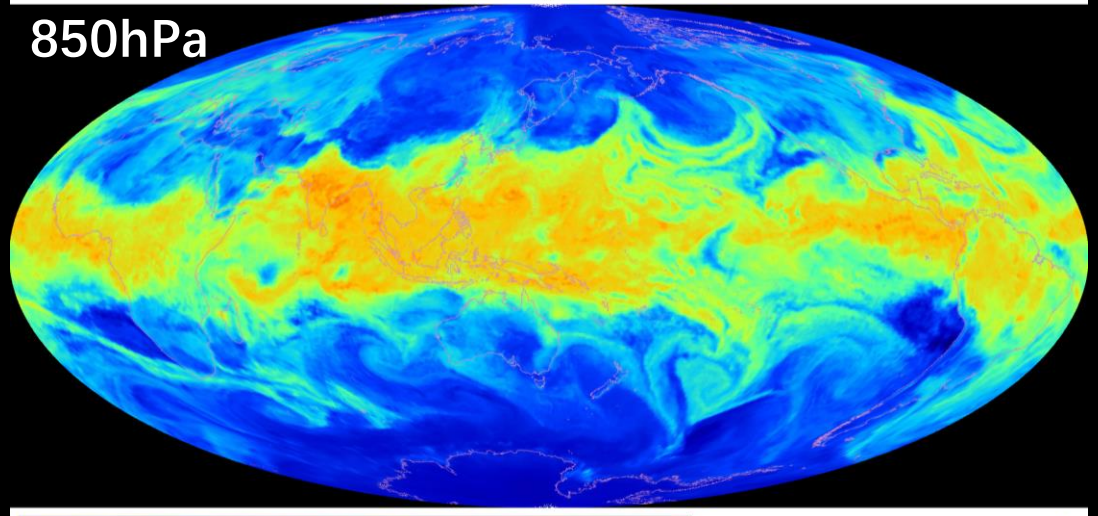
500hPa



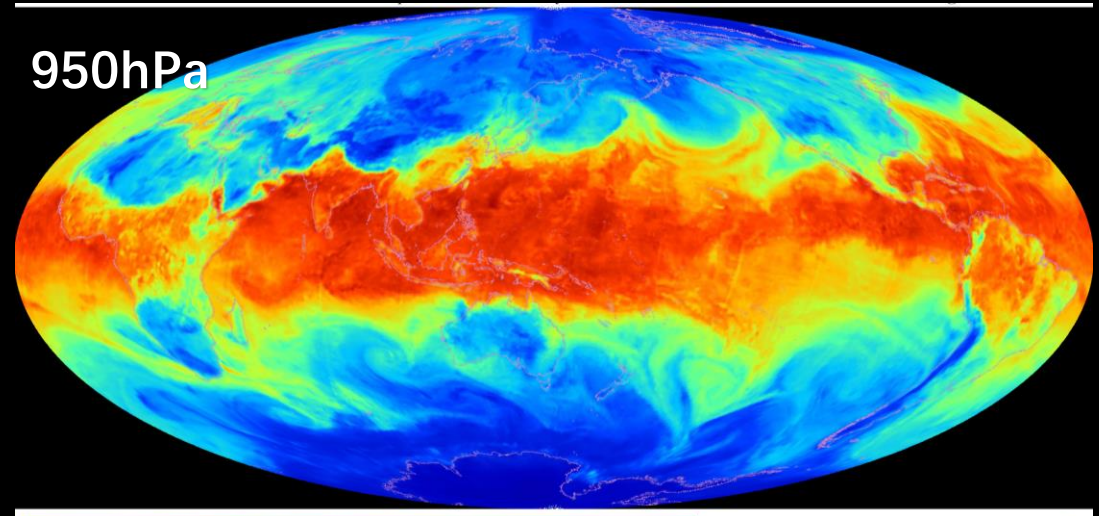
700hPa



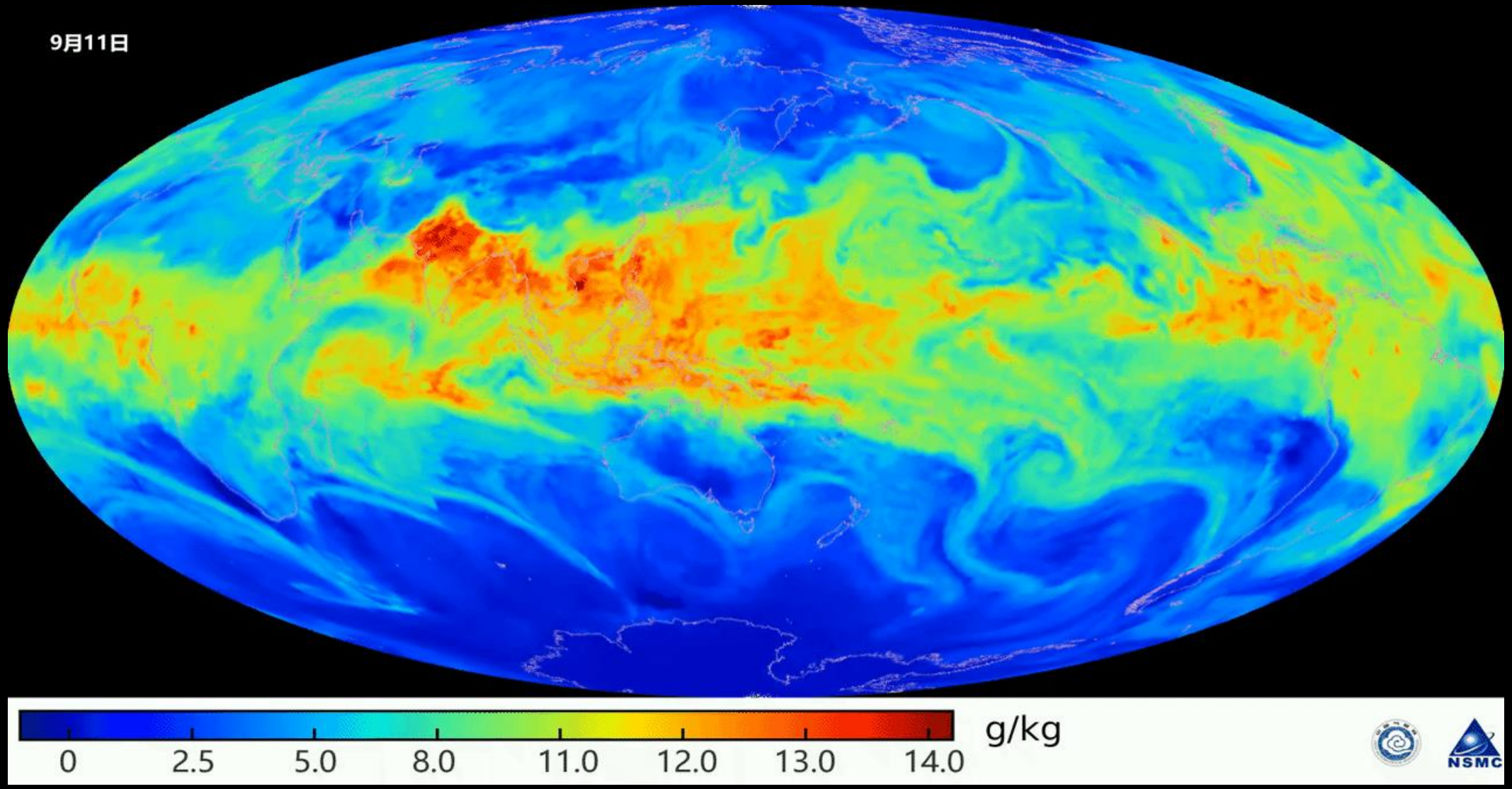
850hPa



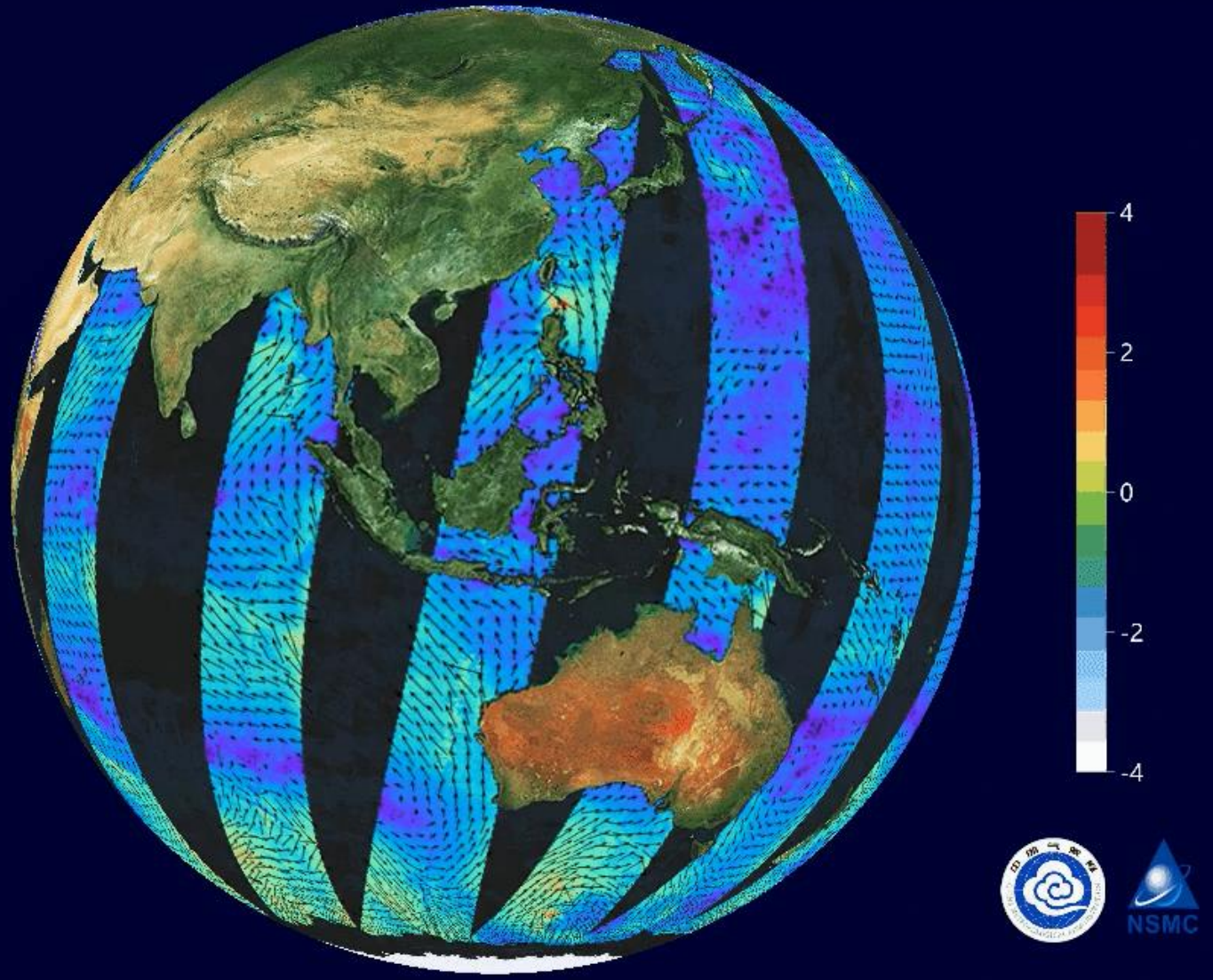
950hPa



FY-3E global humidity animation（2021.9.11-26, EM, 850hPa）



FY-3E 3D Typhoon structure 2021.9.10

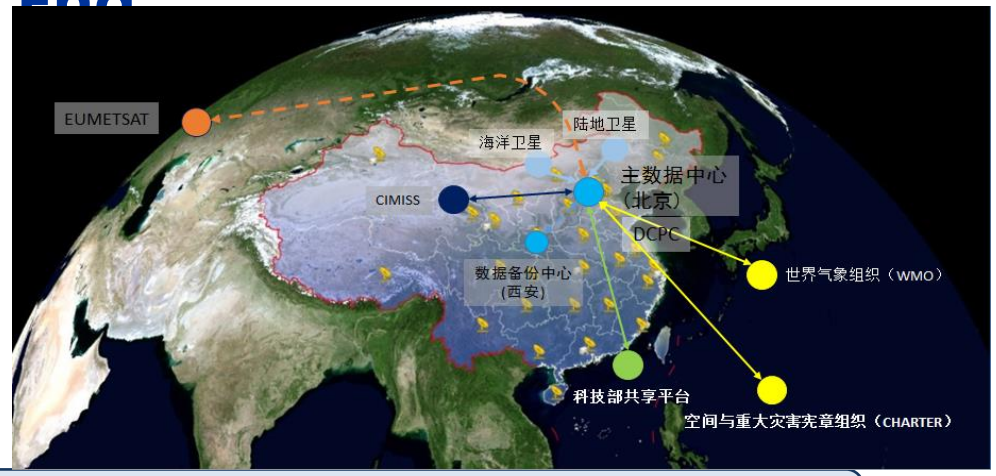


Outline

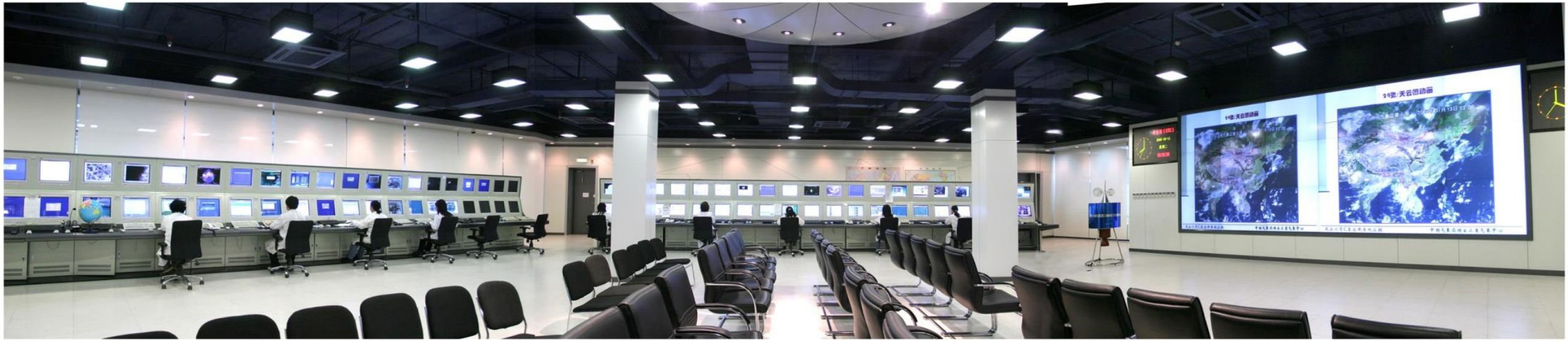
1. Fengyun Program Overview
2. Data, products and services to B&R countries
3. Typical Applications and Examples
4. Bilateral and international cooperation
5. Actions and plans

Data Sharing and Service Capability- “Cloud + End”

- Integrated Space and Ground Based Data Service System
- 15 global data receiving antennas
- Satellite-to-ground transmission rate 480M bps
- Online storage 9PB, near-line storage 80PB
- Adopt 10 Gigabit connection and SDN architecture, supports resource pooling design, and facilitates the development of big data cloud computing work



Timeliness of global data acquisition：2 hours



FengYun Products

Atmosphere（33）

- Aerosol
- *Aerosol optical thickness*
- Aerosol over Land Surface
- Total Precipitable Water
- Precipitation
- Rain Type
- Rain Phase
- Radar Rain Rate
- Atmospheric bending angle
- Atmospheric refractive index
- *Atmospheric density*
- Electron density profile
- ***total sulfur dioxide column***
- ***Total Nitrogen Dioxide column***
- Atmospheric humidity profile (GNOS)
- Atmospheric temperature profile(III、MWRI、GNOS)
- Atmospheric temperature and humid Profile(MWHS-II)
- Atmospheric temperature and humidity Profile(HIRAS/MWHS-II/MWTS-III)
- Atmospheric temperature and humidity Profile(MWHS-III/HIRAS)
- Atmospheric temperature and humidity Profile(MWTS-III/HIRAS)
- Atmospheric temperature and humidity Profile(MWHS-II/MWTS-III/MWRI)
- ***Total oxygen column***
- ***Carbon dioxide mixing ratio***
- ***Methane mixing ratio***
- total ozone column
- ***Nadir Ozone vertical profile***
- ***Limb Ozone vertical profile***

Cloud & Radiation（17）

- Equivalent emission radiation for clear sky
- *OLR of HIRAS*
- *Cloud Top Parameters*
- Top-up Radiation and Clouds
- Surface radiation budget
- ***Total solar irradiance downward from the atmospheric top***
- ***solar band irradiance at the top of the atmosphere***
- Cloud Mask
- Cloud Amount
- CLoud Classification
- *Cloud Top Temperature/Cloud Top Pressure*
- *Cloud Optical Depth*
- *the Effective Radius of Cloud*
- Outgoing Longwave Radiation
- ***Polar Winds***
- ***Water leaving Reflectance***
- ***Cloud Liquid Water Content***

Space Weather（13）

- ***zeta potential***
- ***Radiation dose***
- ***Magnetic field***
- ***particle(Medium and high energy proton、Electronic three-directional flow、Particle throw angle)***
- ***scan imaging***
- ***Push-broom scan imaging***
- ***Aurora egg morphology***
- ***Particle sedimentation***
- ***IPM night product***
- ***IPM daytime product***
- ***IPM multi-angle product***
- ***Solar extreme ultraviolet imager***
- ***solar x ray imager***

Ocean（7）

- Aerosol over Ocean
- Total ***Precipitable Water over Ocean***
- MERSI Sea Surface Temperature
- ***MWRI Sea Surface Temperature***
- ***MWRI Sea surface wind direction***
- GNOS Sea surface wind Speed
- PR Sea surface wind Speed
- PR Sea surface wind direction

Ice&Snow（4）

- Sea ice
- Snow Cover
- Snow Depth
- SWE
- Polar Sea Ice Cover

Biology（4）

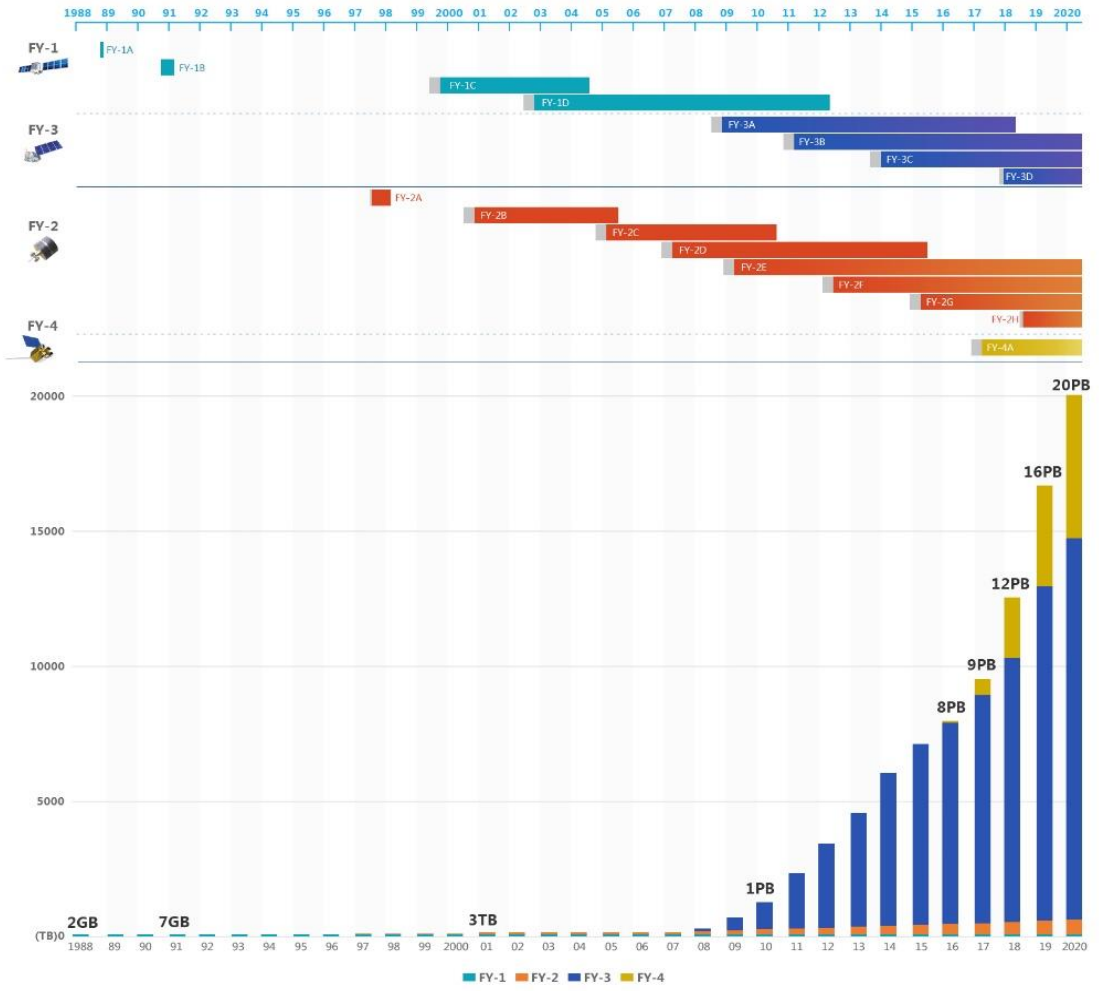
- ***Leaf area index***
- Fraction of Photosynthetically Active Radiation
- Net Primary Production
- ***Chlorophyll fluorescence***
- Vegetation Index

Land（12）

- Land Reflectance Factor
- Land Surface Temperature
- *Land Surface Bidirectional Reflection/ Albedo*
- *Land Cover*
- Dust Product
- *Near-Constant Contrast Image*
- ***City Light/Urban low-light background mosaic***
- *Land Surface Temperature*
- *Soil moisture content*
- Surface pressure
- surface reflectance

• **Operational Product** • ***Research product***

Open data policy



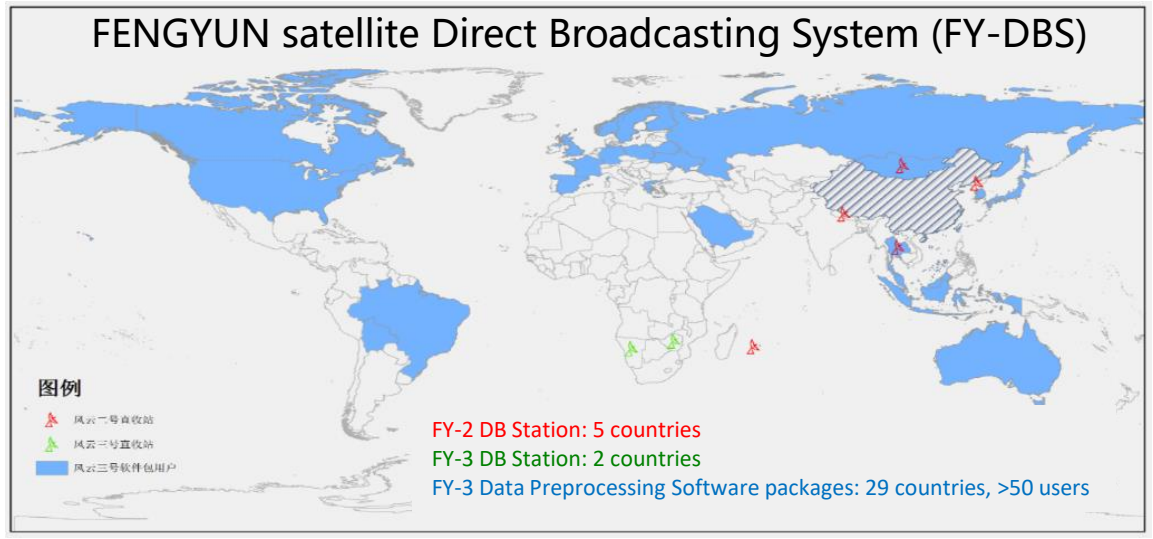
Satellite	Instrument	Data and Products
FY-2	VISSR	L1, L2 and L3
FY-3	MERSI	L1, L2 and L3
	VIRR	L1, L2 and L3
	IRAS	L1, L2 and L3
	MWRI	L1, L2 and L3
	MWTS	L1
	MWHS	L1, L2 and L3
	HIRAS	L1
	* IPM	L1
	* WAI	L1
	* GNOS	L1 and L2
	* SBUS	L1
	* TOU	L1, L2 and L3
	* ERM	L1
	* SIM	L1
	* ERBM	L2
FY-4	AGRI	L1 (Full disk and area observation), L2 and L3
	LMI	L1, L2 and L3
	GIIRS	L1 and L2

Data services

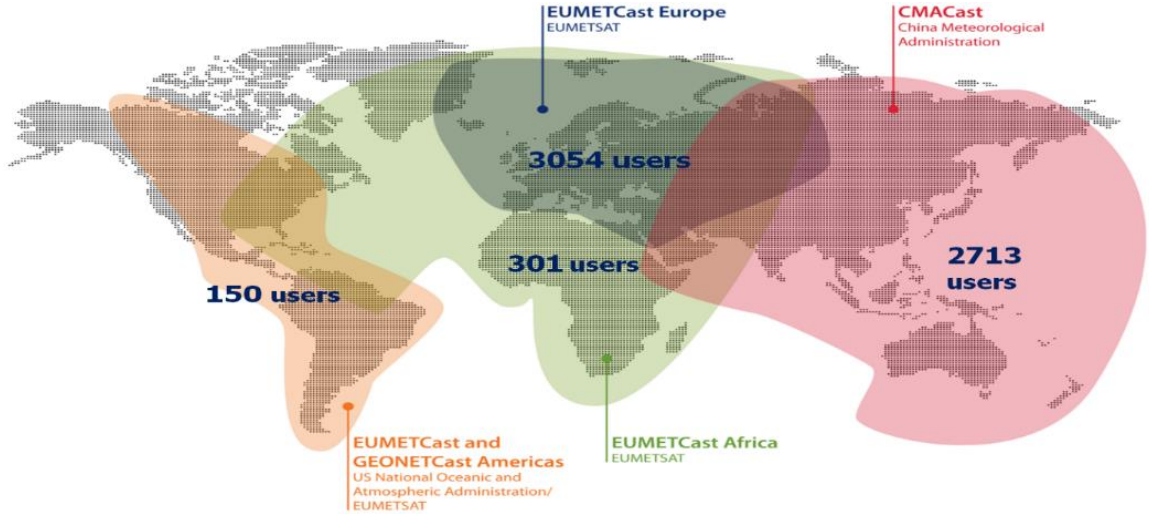
Main data services

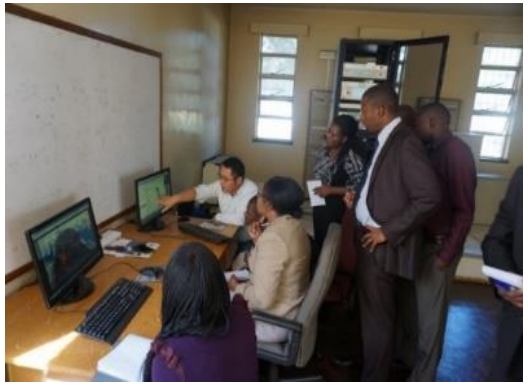
- For real-time users
  - Direct broadcasting system
  - CMACast
  - FY-3 software packages
  - WIS/GTS
  - Internet (FTP and public cloud)
- For non real-time users
  - Data service website
  - Data download toolkit
  - Data customization

Space based data services



CMACast has been deployed in 21 countries

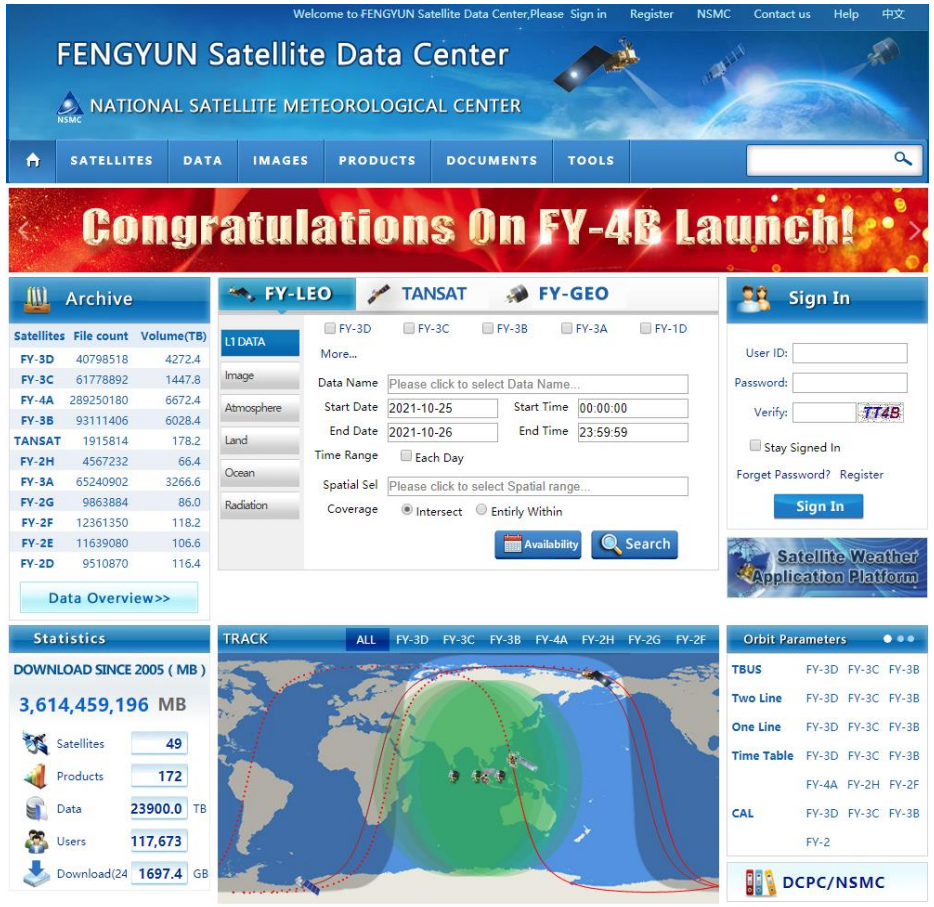




Internet based data services

Data center website

http://data.nsmc.org.cn



Data download toolkit

http://fy4.nsmc.org.cn/nsmc/en/data/pcclient.html

Internet based data services

Real-time data server:

- Last 30 days
- AGRI/GIIRS L1 data
- 46 L2 products

Account apply:

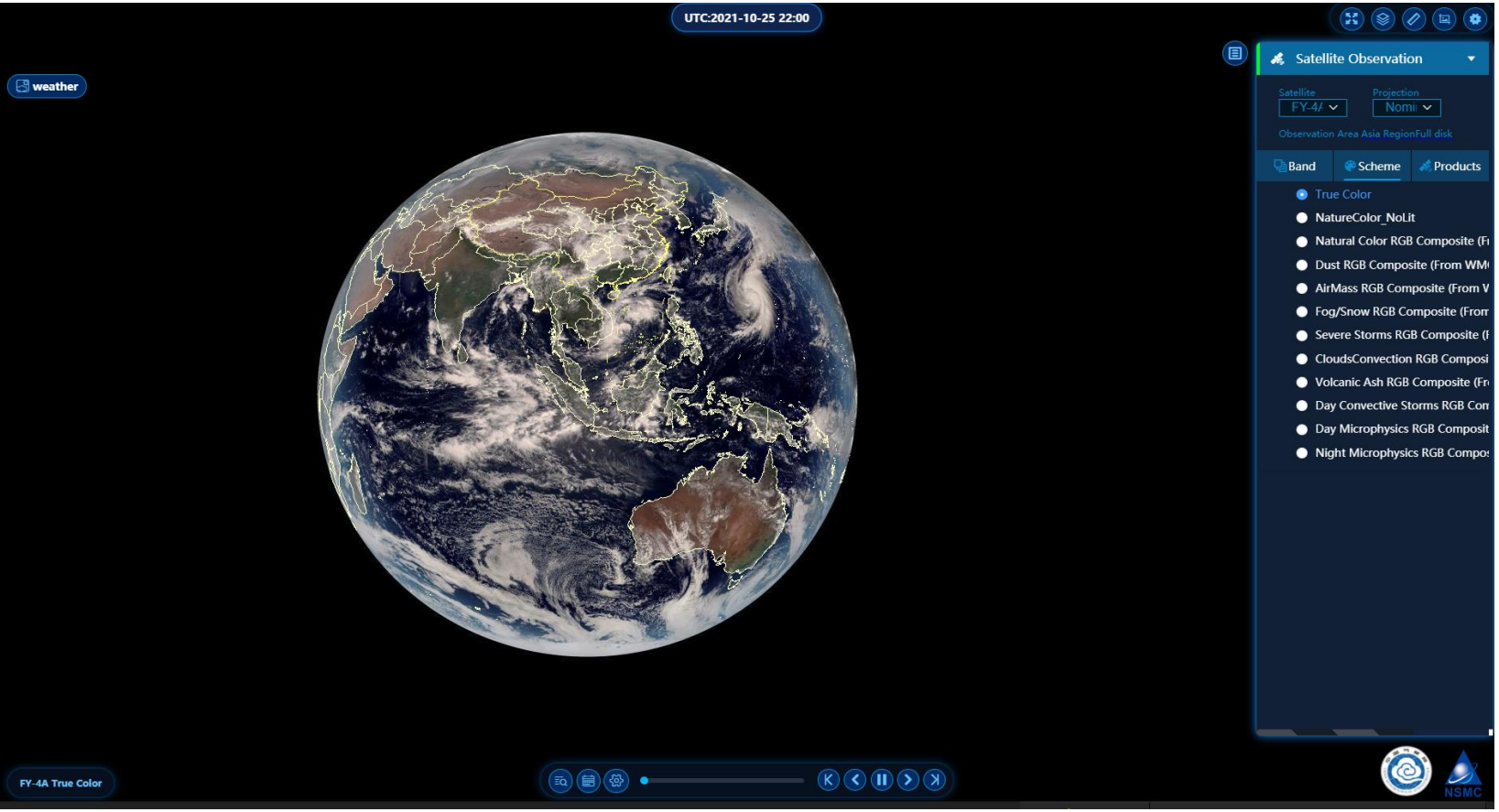
https://fy4.nsmc.org.cn/data/en/data/realtime.html.

Real-time FY-4A product list

Atmospheric Correction Image, Full Disk	Downgoing Longwave Radiation, Full Disk
Atmospheric Correction Image, China Regional	Dust Storm Detection, Full Disk
Atmospheric Motion Vector, High Level	Dust Storm Detection, China Regional
Atmospheric Motion Vector, Low Level	Fire Hot Spot Detection, Full Disk
Atmospheric Motion Vector, Infrared	Fire Hot Spot Detection, China Regional
Cloud Footage Rate, Full Disk	Fog Detection, Full Disk
Cloud Footage Rate, Northern Hemisphere	Liquid Percentage Water, Full Disk
Convection Index, Full Disk	Liquid Percentage Water, China Regional
Convection Index, China Regional	Land Surface Emissivity, Full Disk
Cloud Mask, Full Disk	Land Surface Temperature, Full Disk
Cloud Mask, China Regional	Outgoing Longwave Radiation, Full Disk
Cloud Phase, Full Disk	Quantitative Precipitation Estimation, Northern Hemisphere
Cloud Phase, China Regional	Quantitative Precipitation Estimation, China Regional
Cloud Type, Full Disk	Reflective Shortwave Radiation, Full Disk
Cloud Type, China Regional	Surface Solar Incidence Radiation, Full Disk
Cloud Top Height, Full Disk	Sea Surface Temperature, Full Disk
Cloud Top Height, China Regional	Black Body Temperature, Full Disk
Cloud Top Pressure, Full Disk	Black Body Temperature, China Regional
Cloud Top Pressure, China Regional	Tropopause Folding, Full Disk
Cloud Top Temperature, Full Disk	Tropopause Folding, China Regional
Cloud Top Temperature, China Regional	Upgoing Longwave Radiation, Full Disk
LMI Event In One Minute	Atmosphere Vertical Profile, Regional Dwell
LMI Group In One Minute	Atmosphere Vertical Profile, Regional

Web based applications

Satellite Weather Application Platform -SWAP2.0



- **English**

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

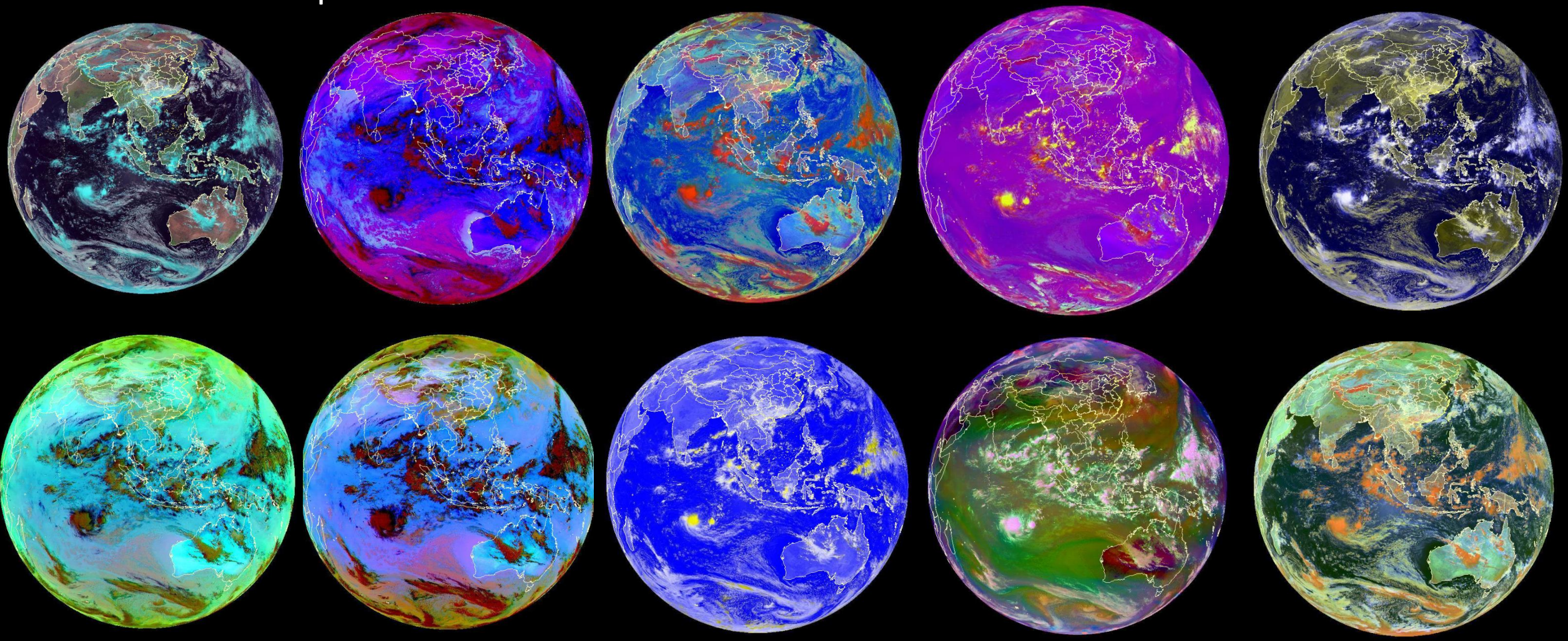
- **Russia**

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

Main functions

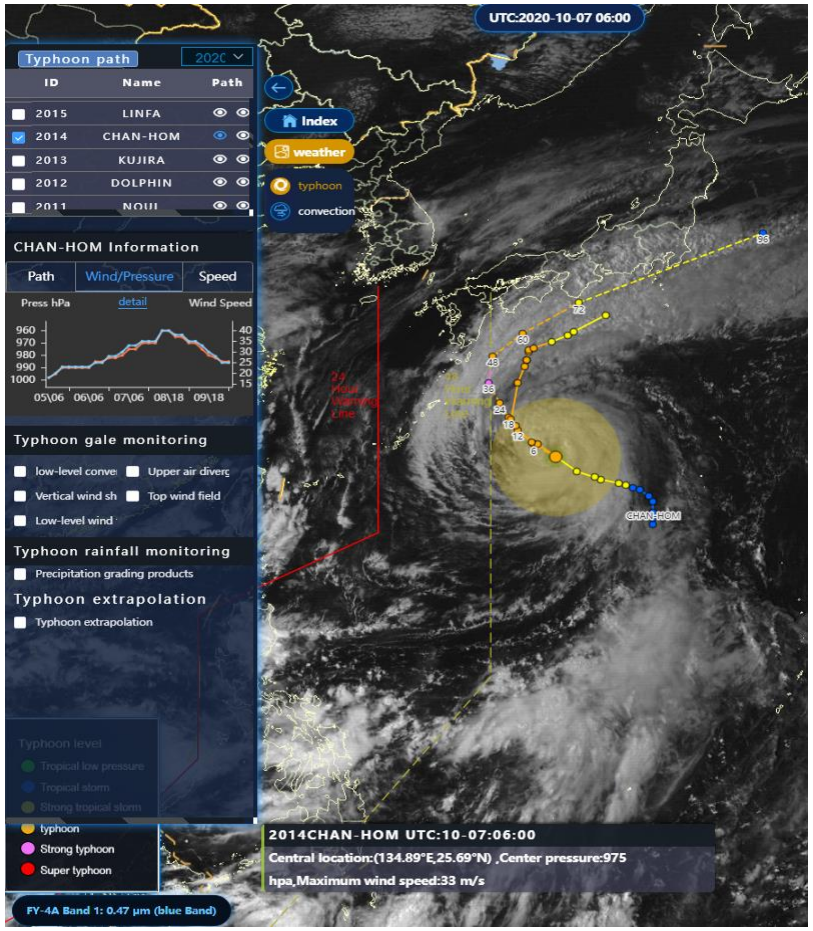
- Near real-time images of FY-2H and FY-4A
- 30+ GEO satellite products
- Special applications on weather forecasting
- Animation generation and sharing

Several RGB composite schemes

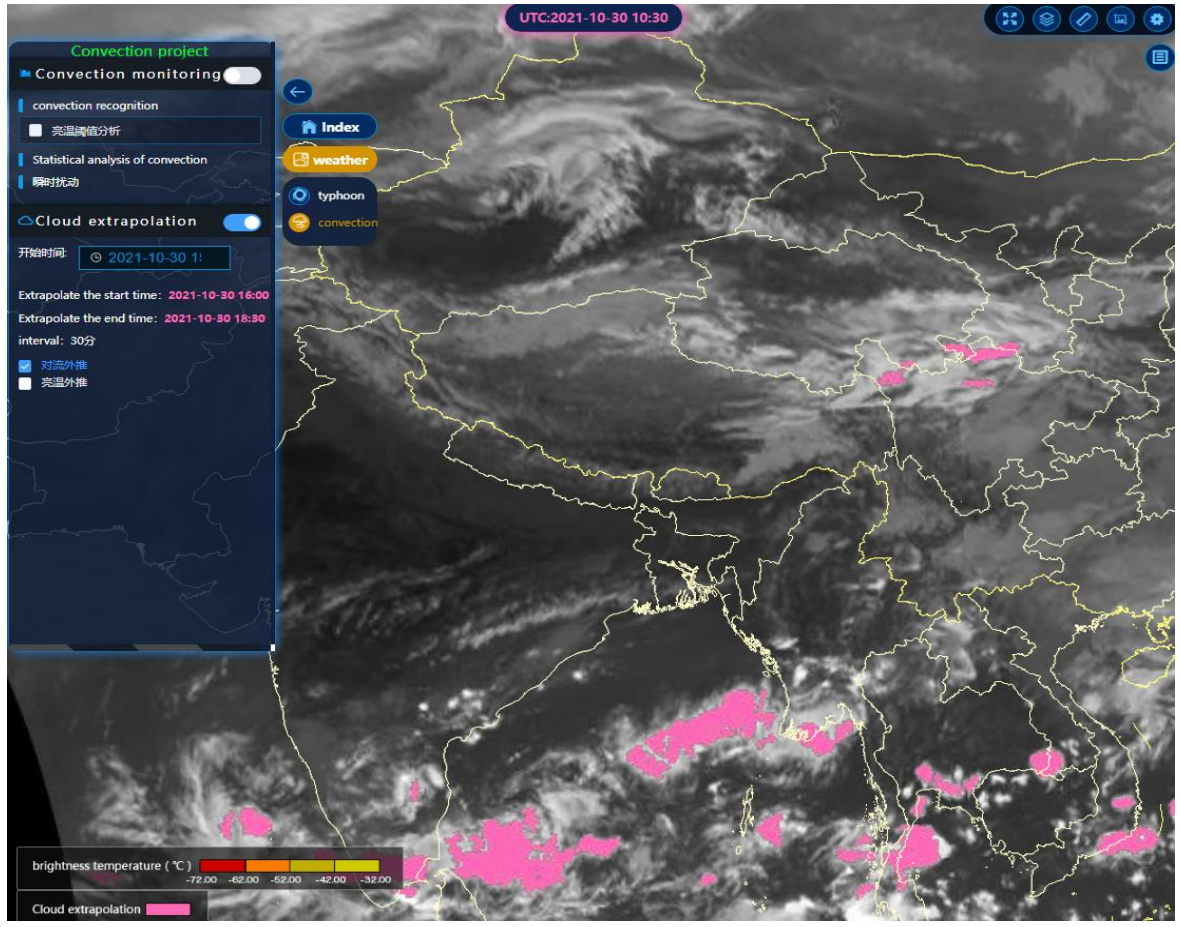


Web based thematic applications

Typhoon analysis

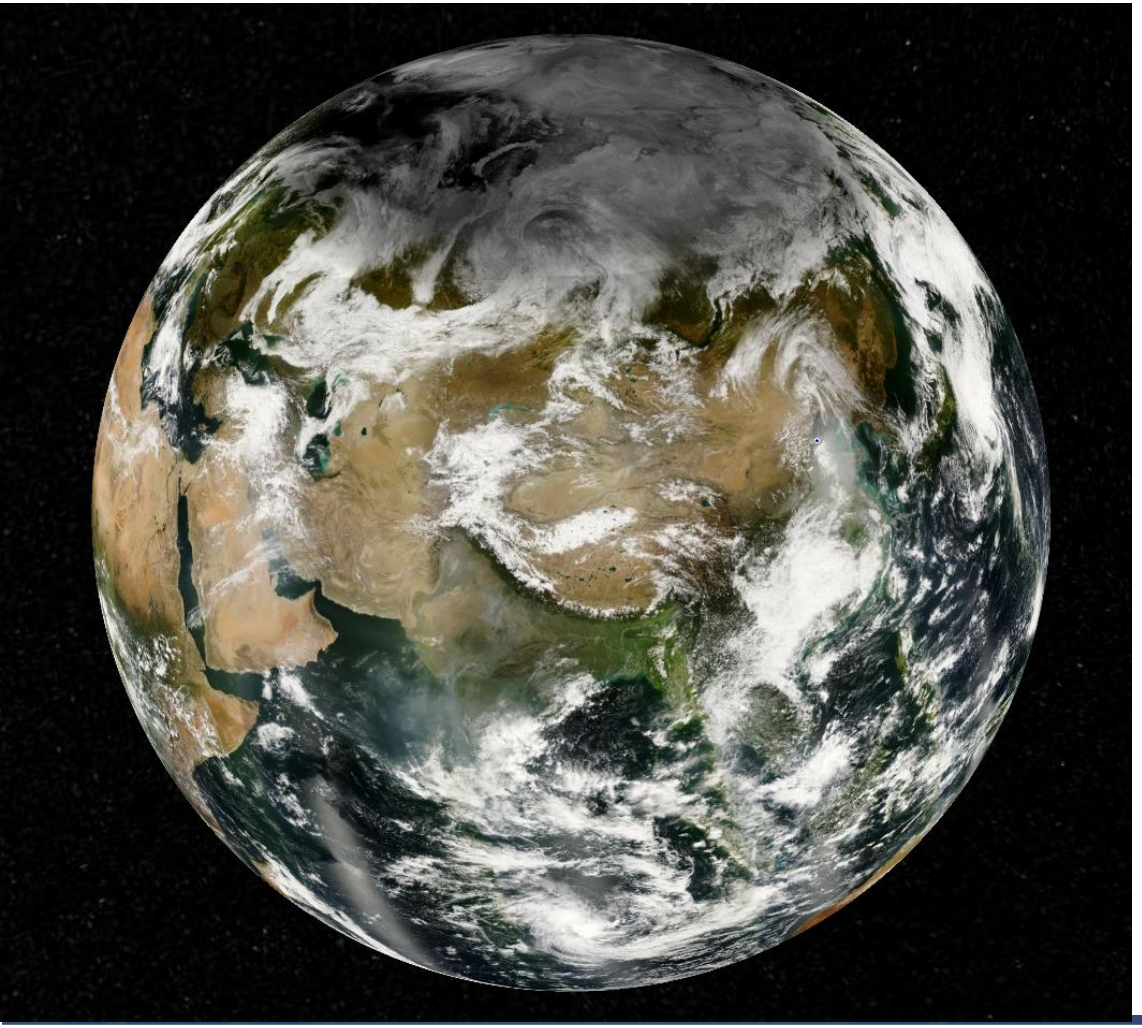


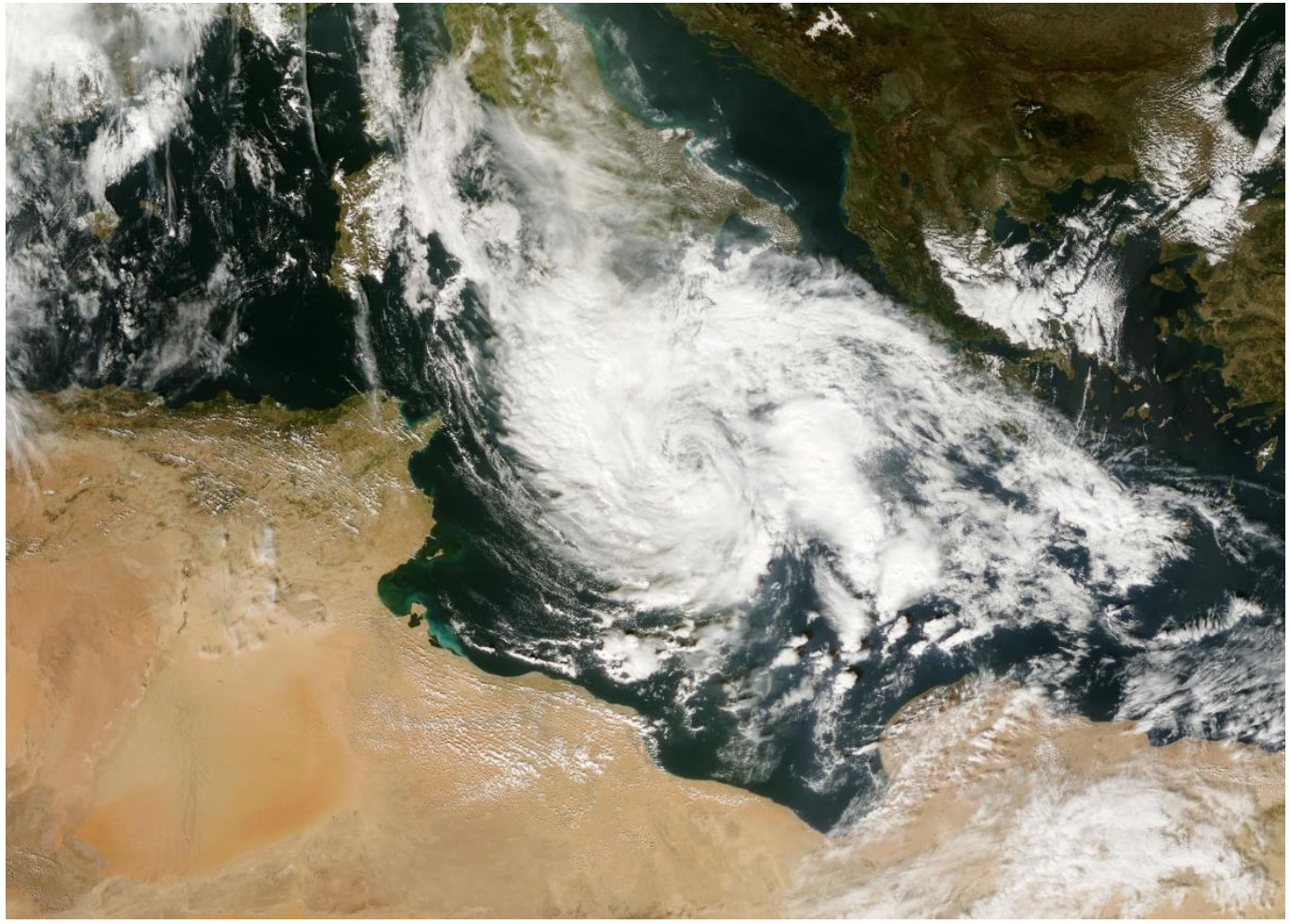
Convective analysis and forecast



Web based applications

Fengyun Earth Viewer https://fy4.nsmc.org.cn/mips/

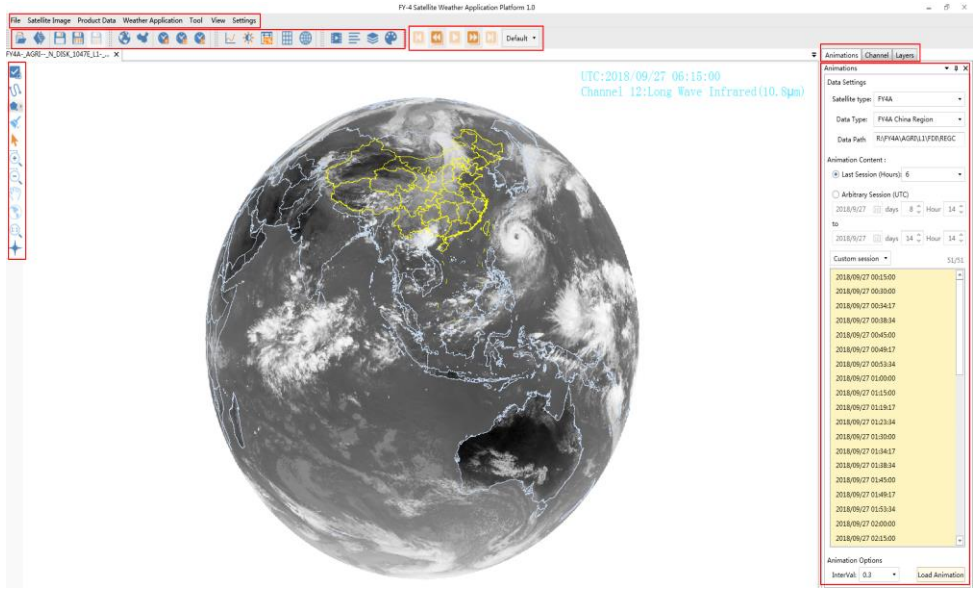




Software applications

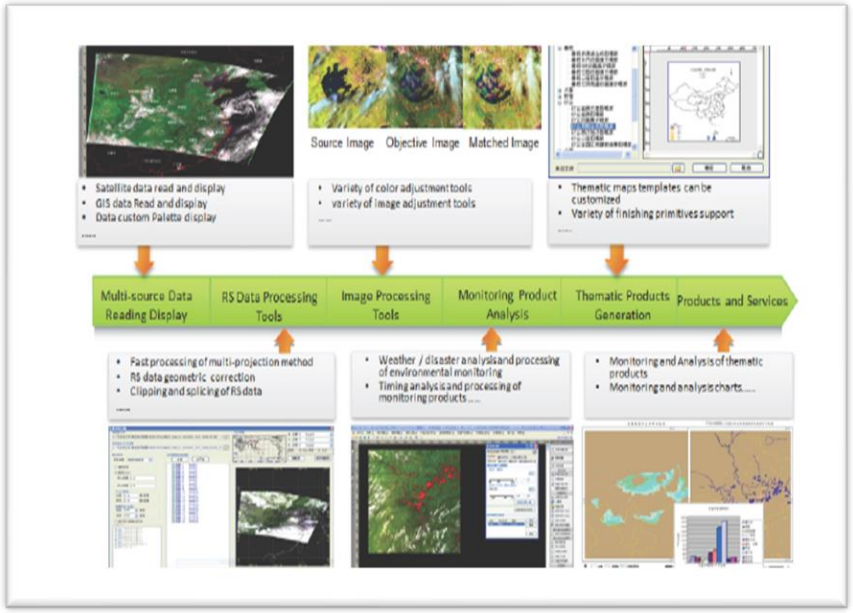
SWAP 2.0 stand alone version

Weather monitoring and analysis
---Geostationary Satellite data (FY-2/FY-4)



Satellite Monitoring Application Remote sensing Toolkit -SMART

Natural disaster and environment monitoring and analysis
---polar orbit Satellite data



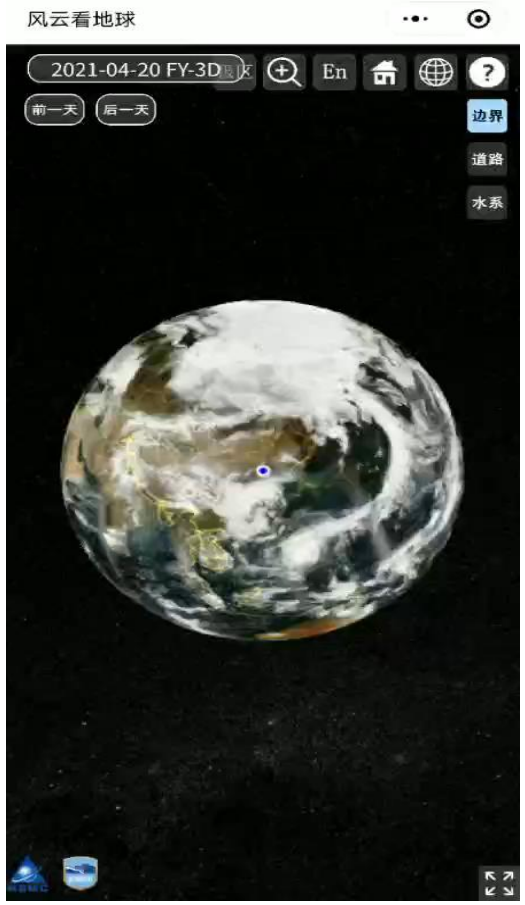
Mobility applications -WeChat applet

Fengyun Now

IMAGE

VIDEO

Fengyun Earth



Emergency service

the FY_ESM website support more efficient services for disaster mitigation and prevention.

http://fy4.nsmc.org.cn/service/en/emergency/index.html

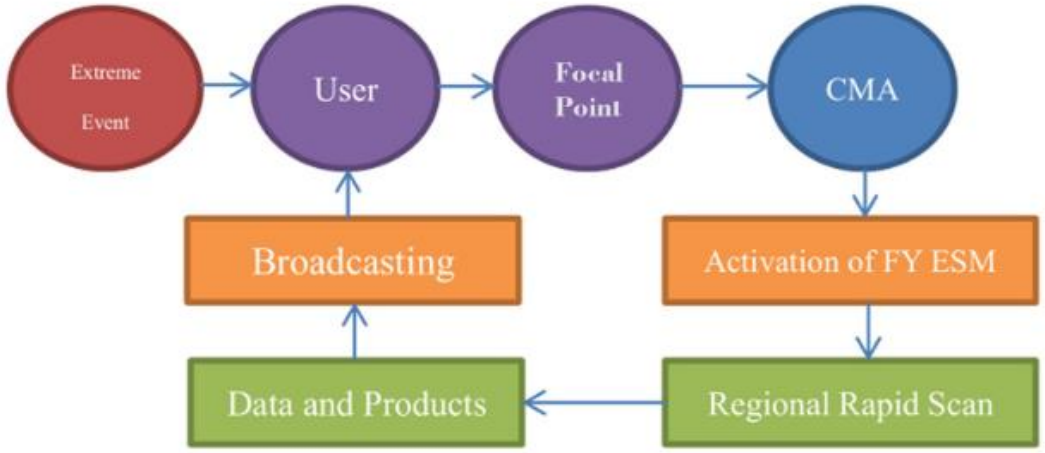
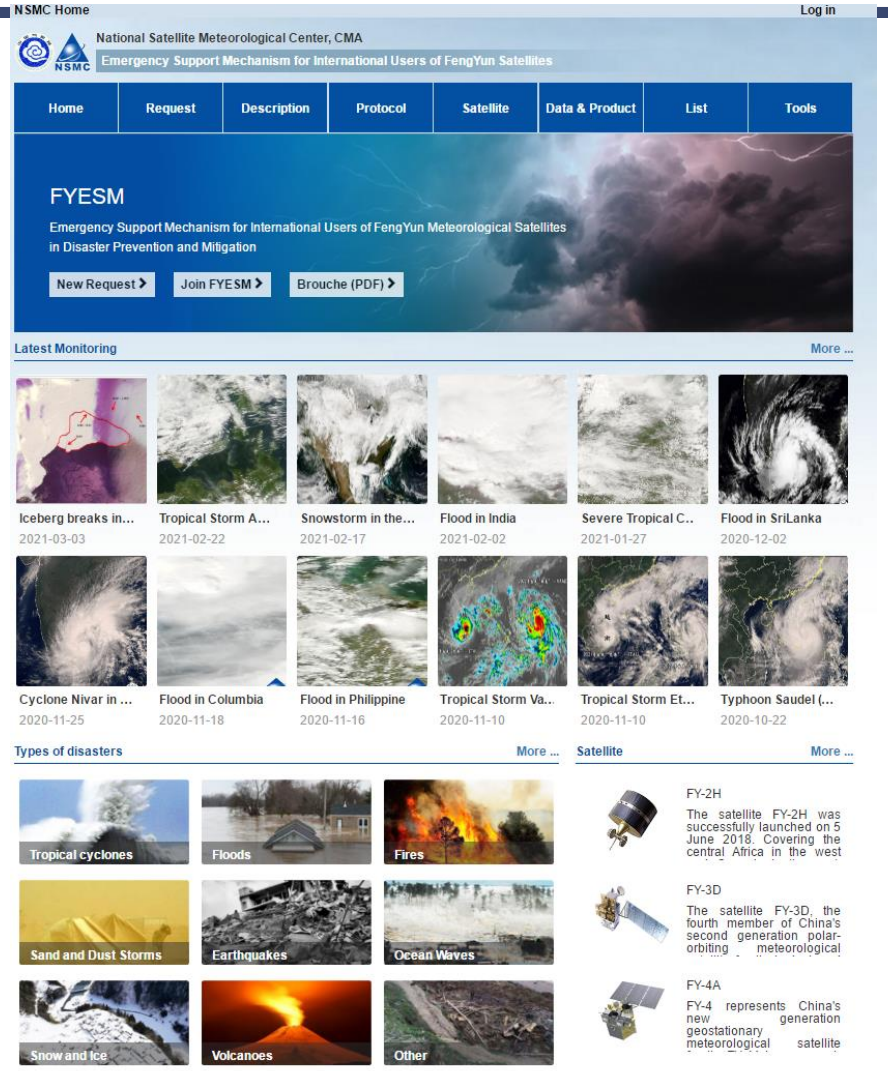


Figure:Activation of FY ESM

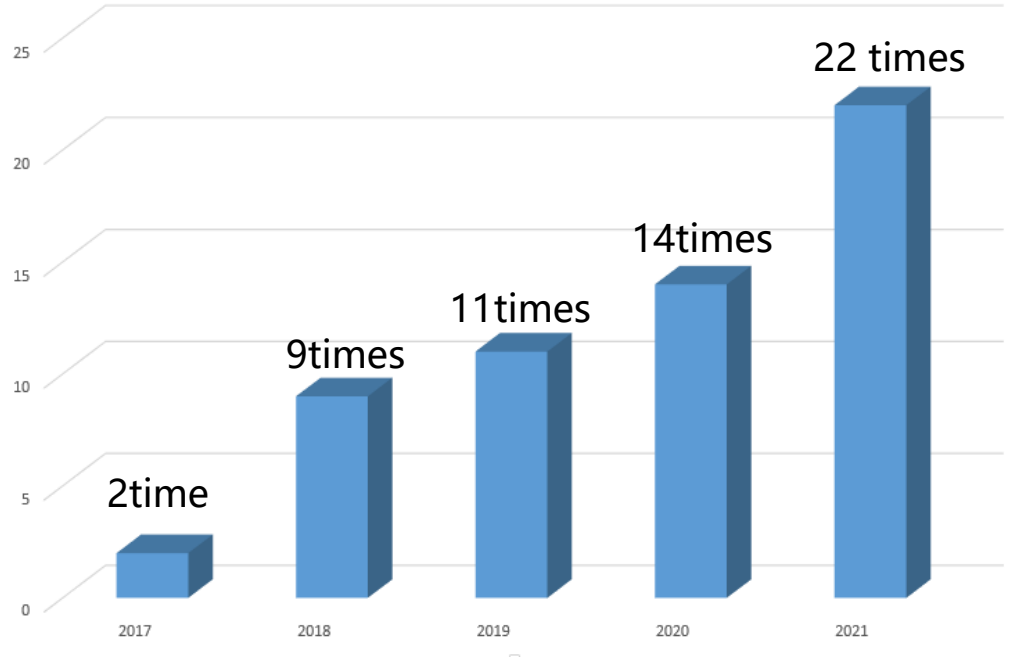


Emergency service (30 registered countries)

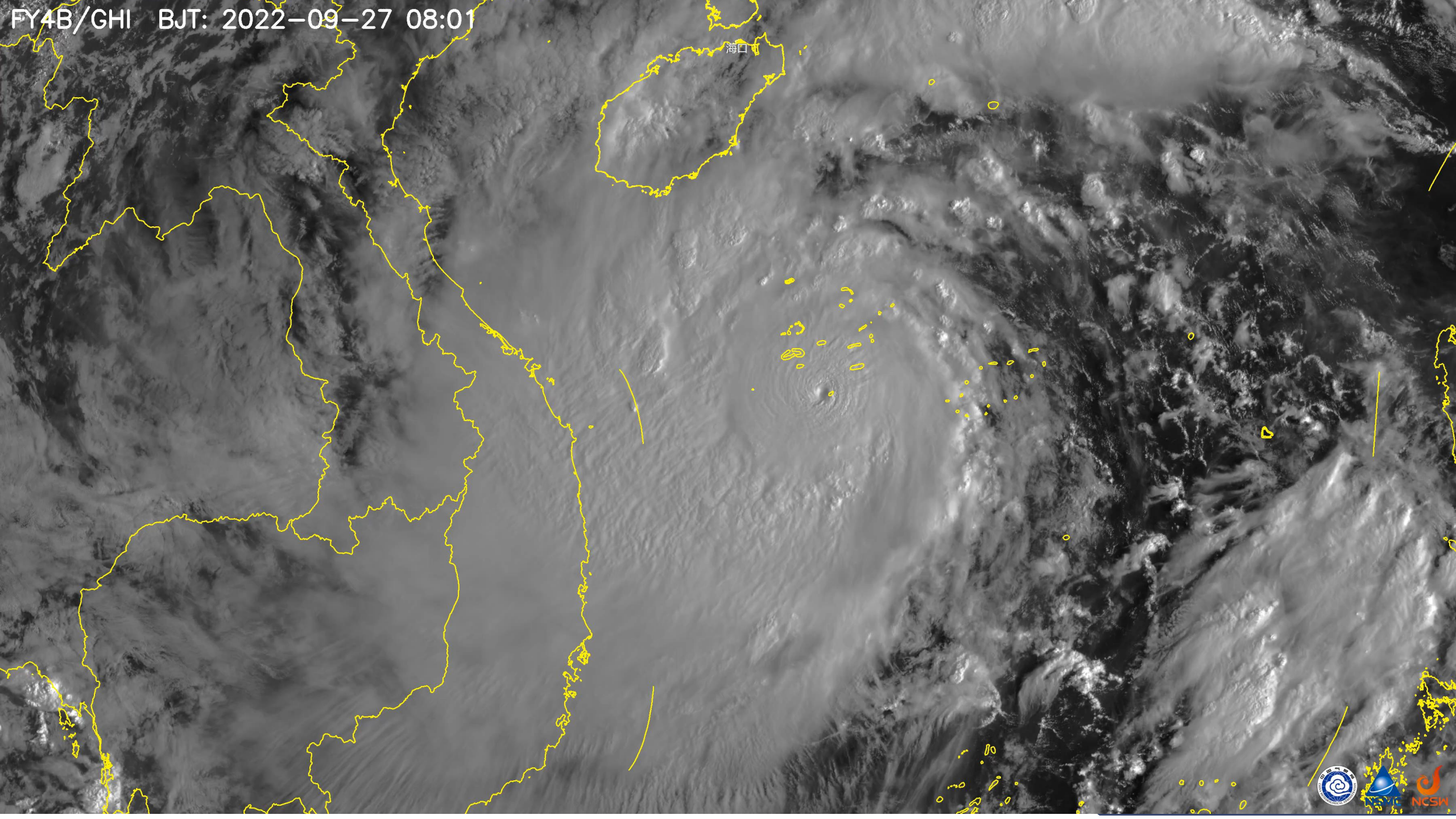
Emergency support in 2021

ID	Date	Country	Disaster
1	28/1/2021	Swaziland	Tropical cyclone & Flood
2	8/2/2021	India	Flood
3	23/2/2021	Philippines	Tropical cyclone & Flood
4	7/4/2021	Indonesia	Flash Flood
5	8/4/2021	Timor-leste	Tropical cyclone
6	13/4/2021	Saint Vincent	Volcanic eruptions
7	24/5/2021	Congo	Volcanic eruptions
8	7/6/2021	Siri Lanka	Oil spill
9	8/6/2021	Siri Lanka	Flood
10	22/7/2021	Russia	Wildfire
11	29/7/2021	Tunisia	Wildfire
12	9/8/2021	Russia	Flood
13	19/8/2021	Russia	Wildfire
14	3/10/2021	United Arab Emirates	Tropical cyclone
15	4/10/2021	Oman	Tropical cyclone
16	13/11/2021	Sri Lanka	Flood
17	7/12/2021	Indonesia	Volcanic eruptions
18	9/12/2021	Micronesia	Flood

- Observation data and imagery
- Emergency EO monitoring analysis report



FY-ESM Requests increased year -on-year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海口

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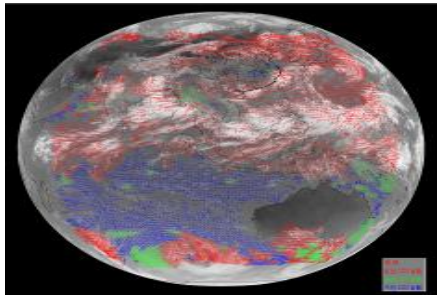
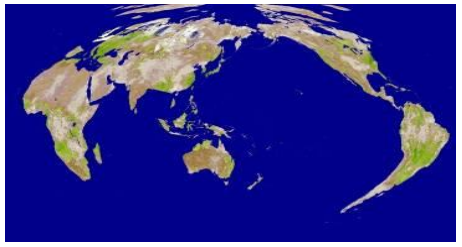
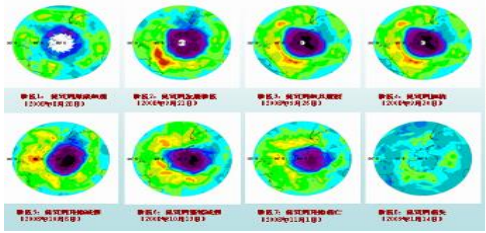
FengYun Application

- **Weather Monitoring and Analysis**
  - Tropical Cyclone
  - Heavy Rain
  - Dust Storm
  - Fog
- **Climate Monitoring and Analysis**
  - SST
  - O_3
  - Carbon neutral
- **Natural Disaster Monitoring**
  - Flood
  - Fire
  - Snow
  - Drought
- **Environment Monitoring**
  - Vegetation Growth
  - Water Body Change
  - Blue Green Alga Monitoring
  - Sea Ice
  - Atmospheric Composition
  - Heat Island

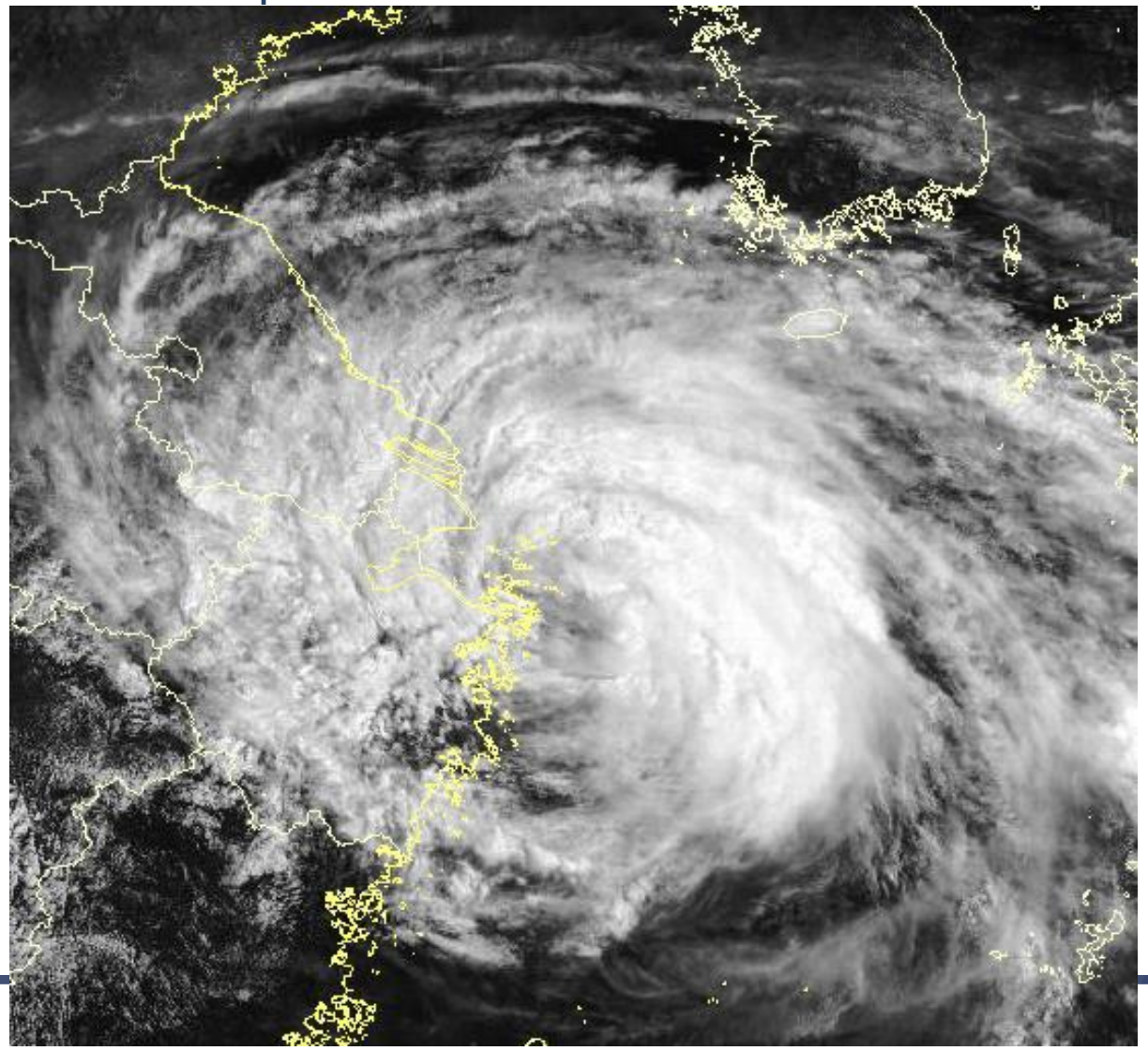




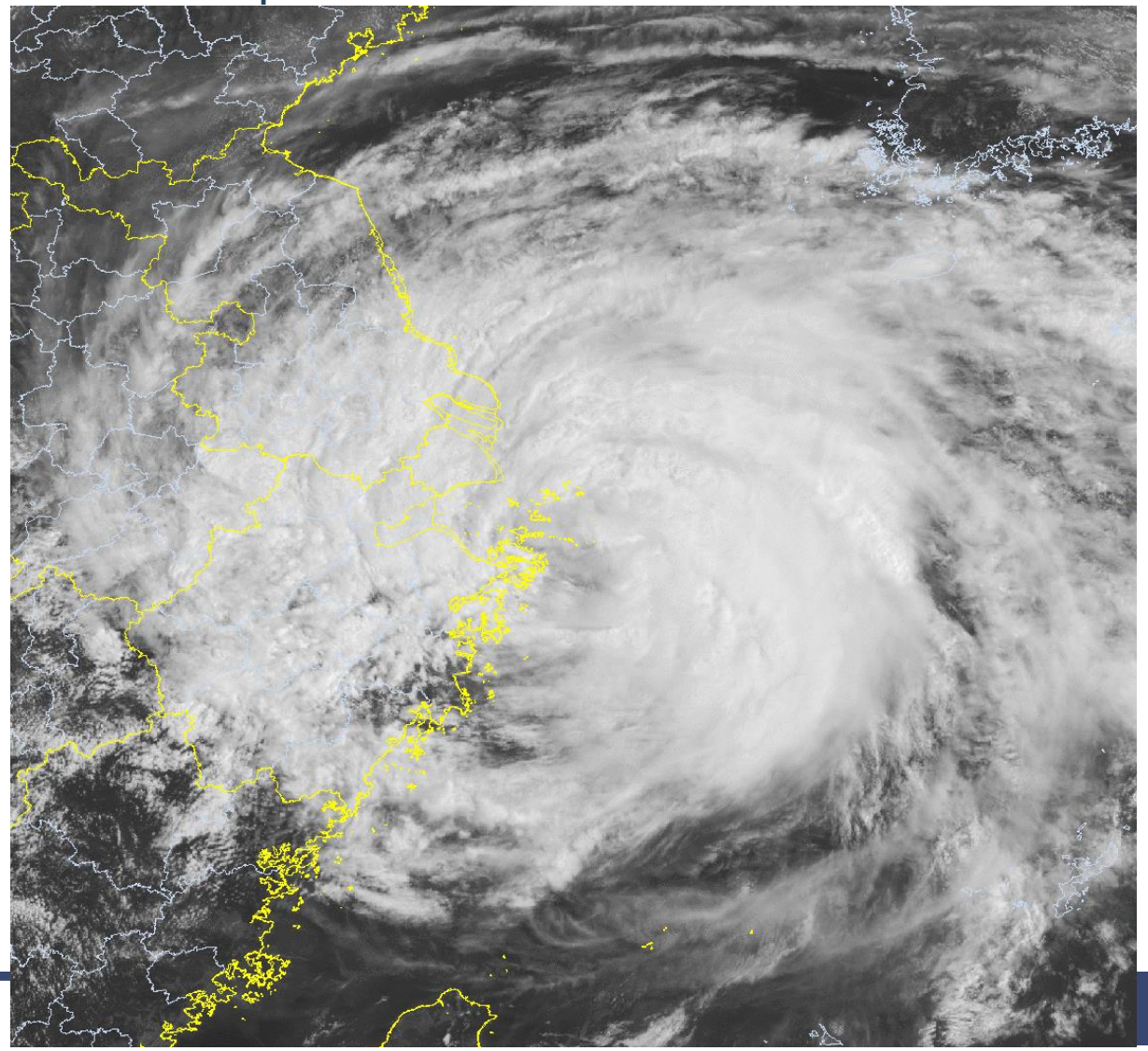




Typhoon

FY-4A Temporal resolution: 5mins

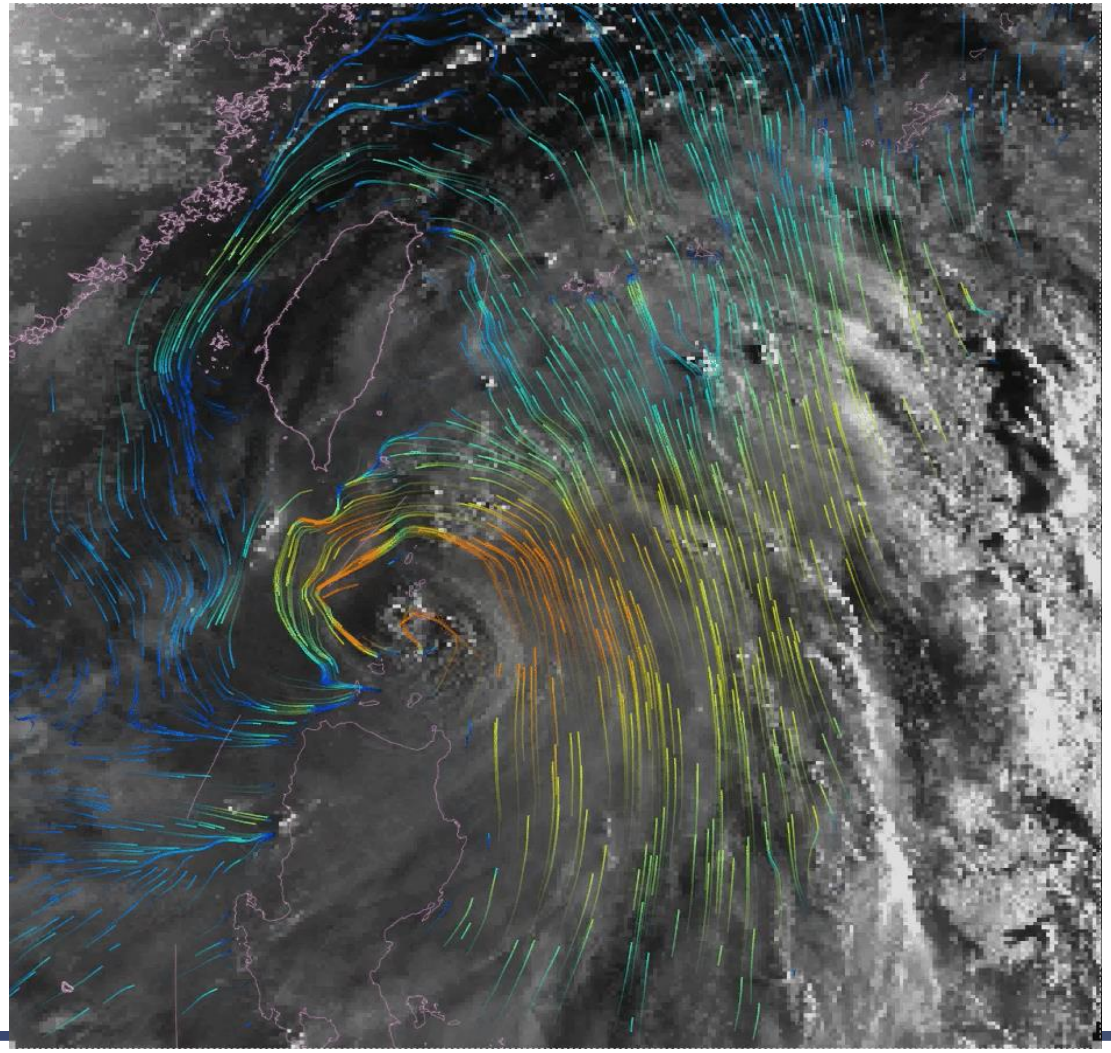


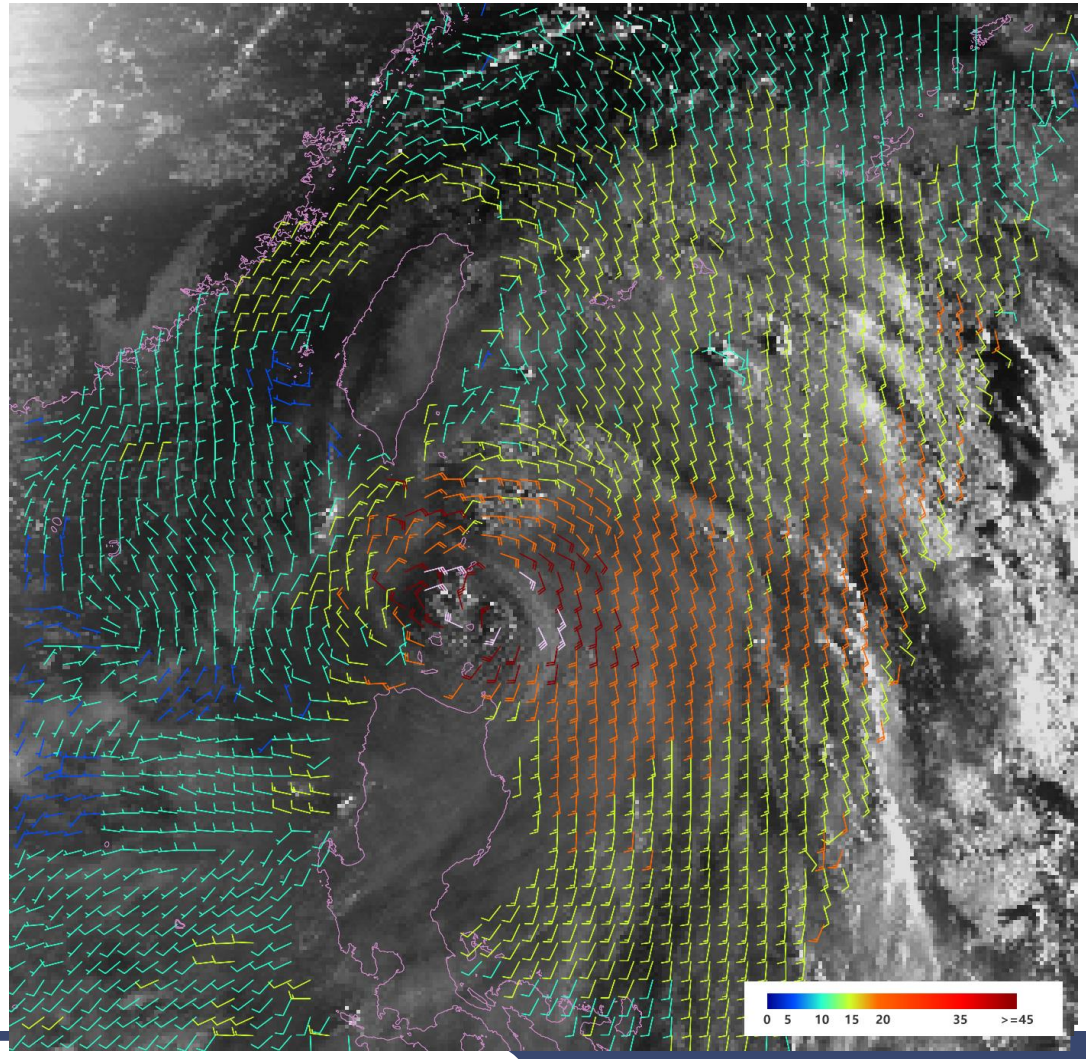
FY-4B Temporal resolution: 1min



Typhoon

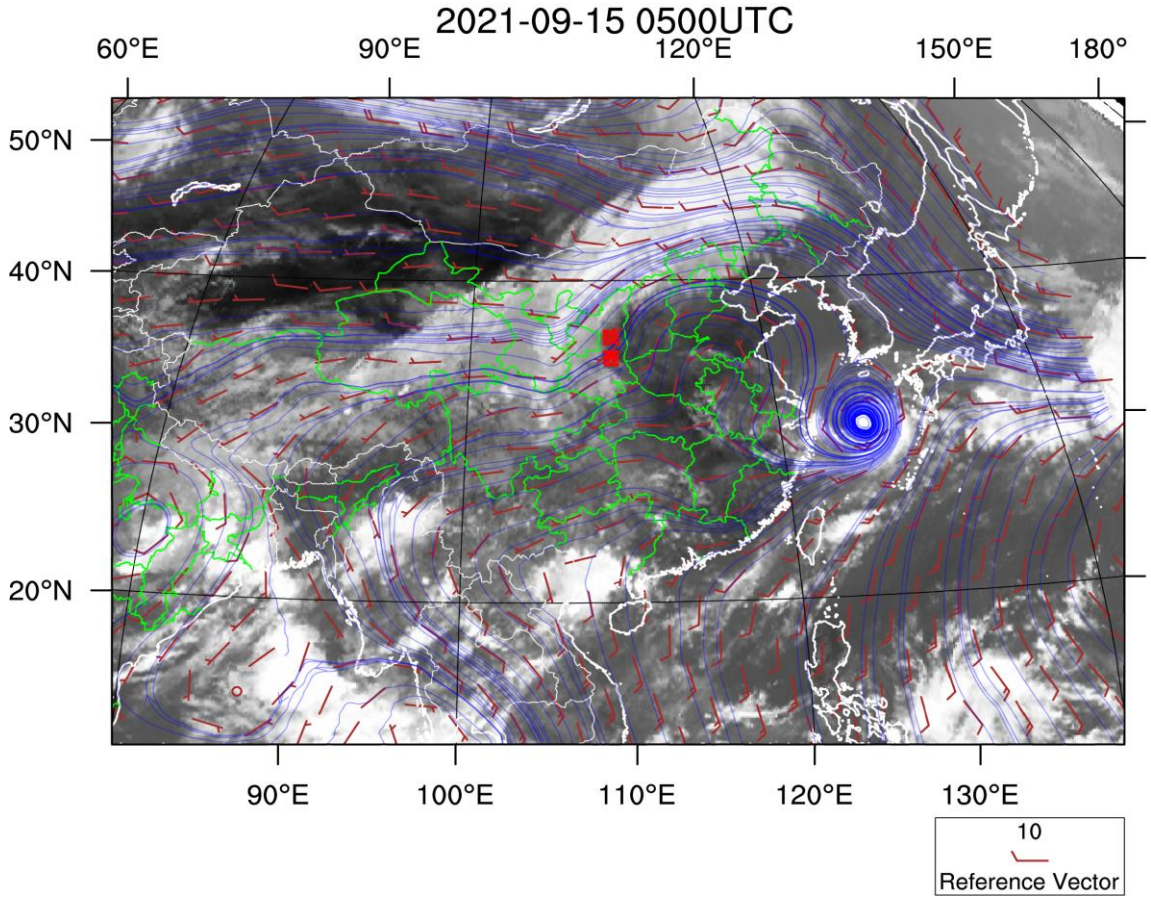
FY-3E Ocean Wind Vector and lowlight imager



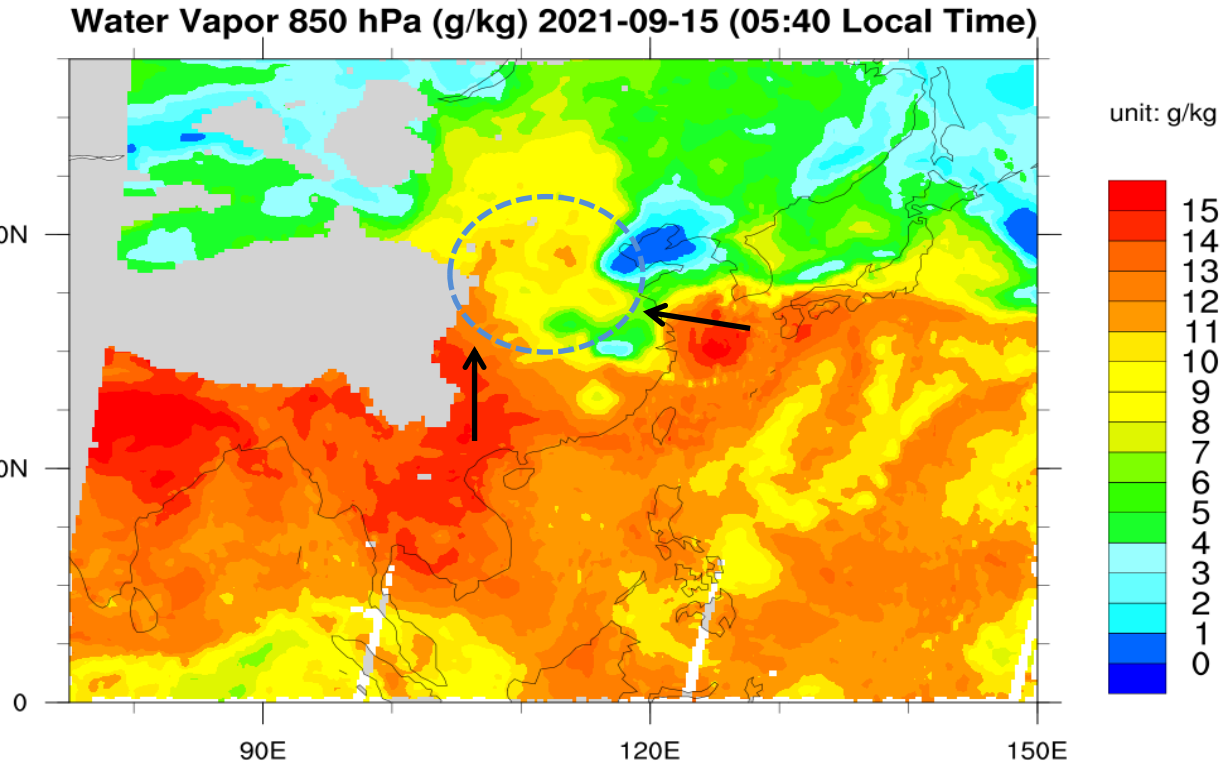


Nowcasting

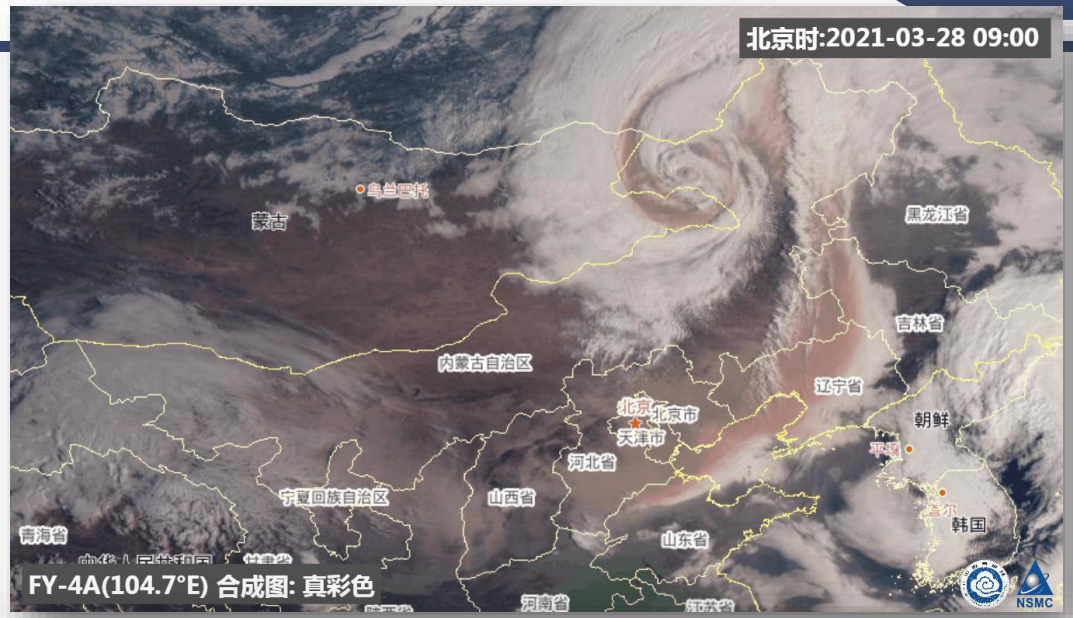
FY-2&4 Integrated Atmospheric motion vector

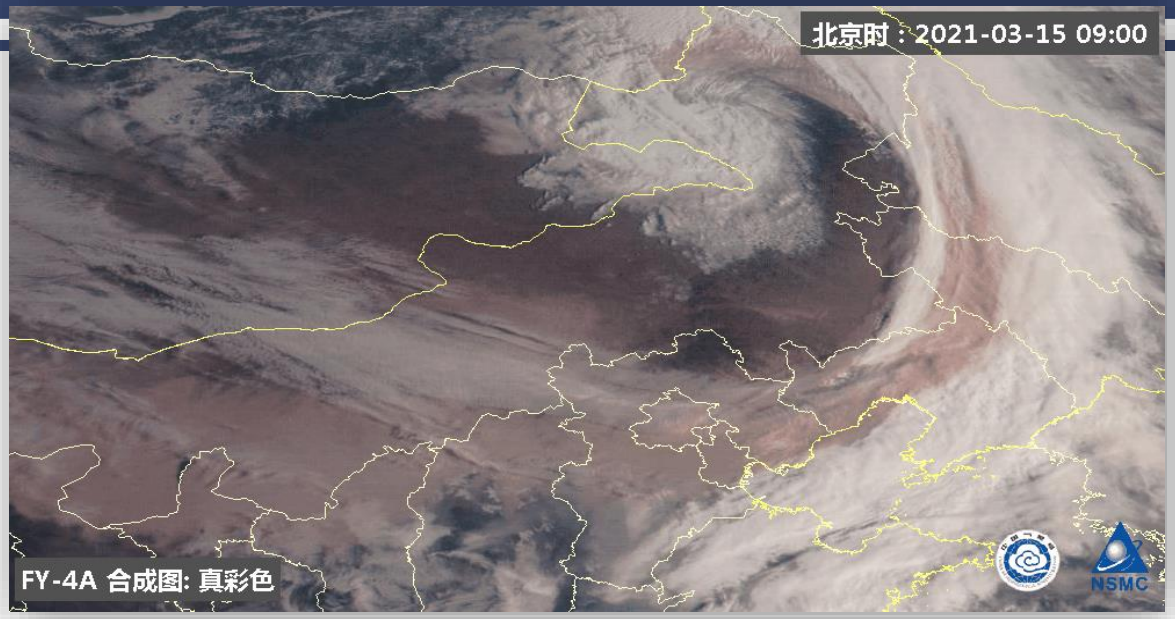


FY-3E Atmopheric humidity



Sand Storm


北京时:2021-03-28 09:00
蒙古
乌兰巴托
黑龙江省
吉林省
内蒙古自治区
辽宁省
朝鲜
北京
北京市
天津市
河北省
宁夏回族自治区
山西省
韩国
青海省
山东省
河南省
FY-4A(104.7°E) 合成图: 真彩色
NSMC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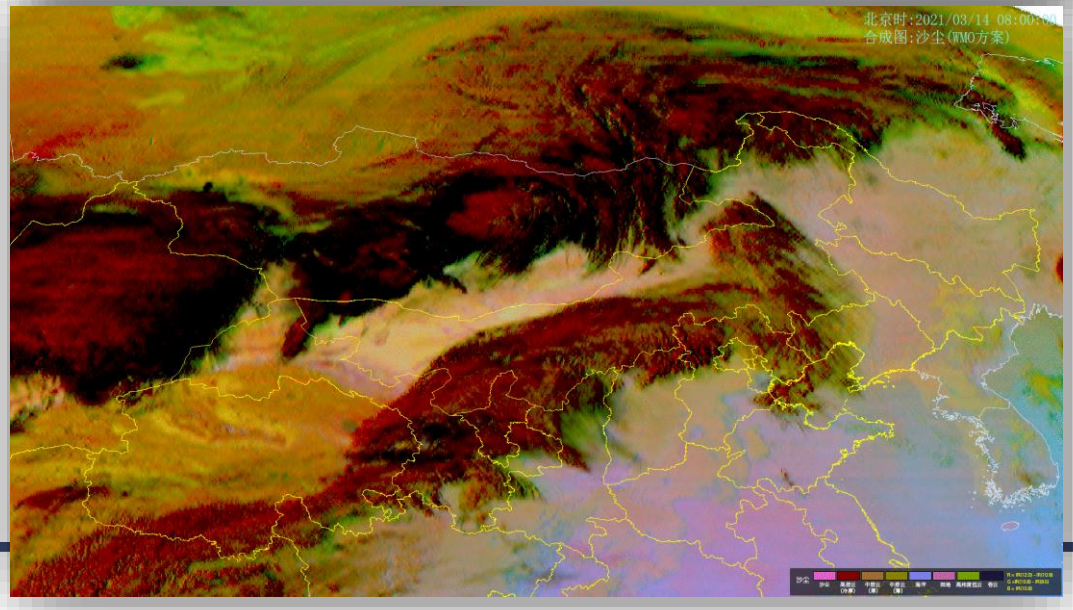
FY-4A 合成图: 真彩色
NSMC

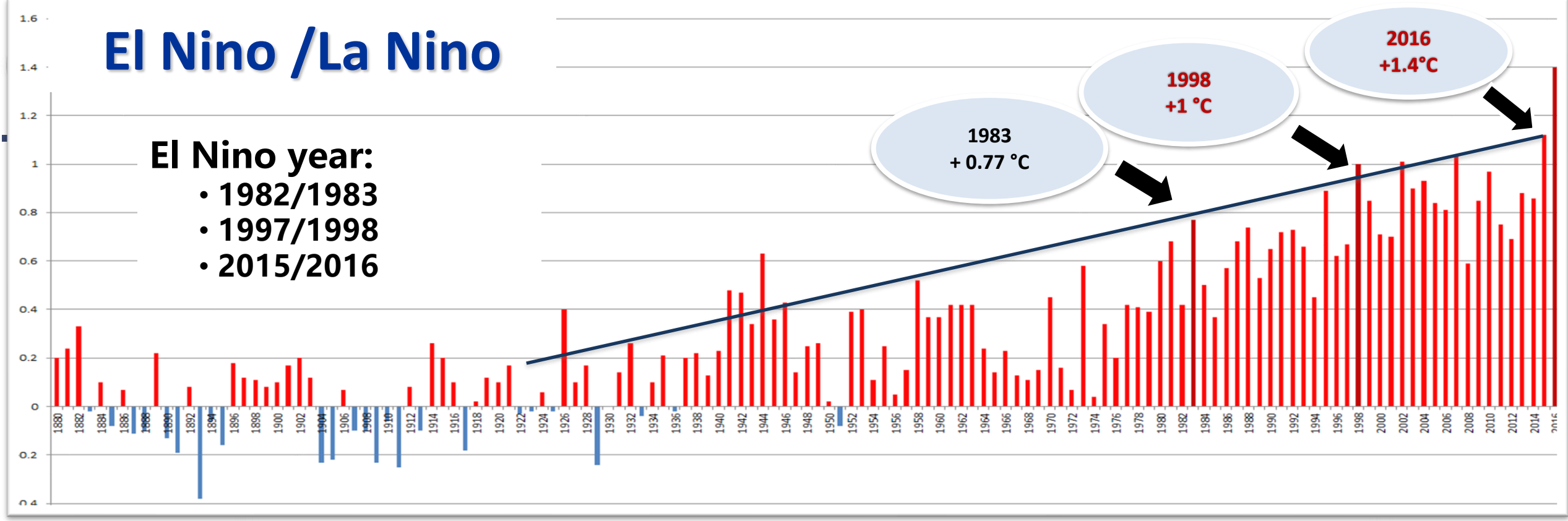

北京时:2021/03/14 08:00
合成图:沙尘(WMO方案)

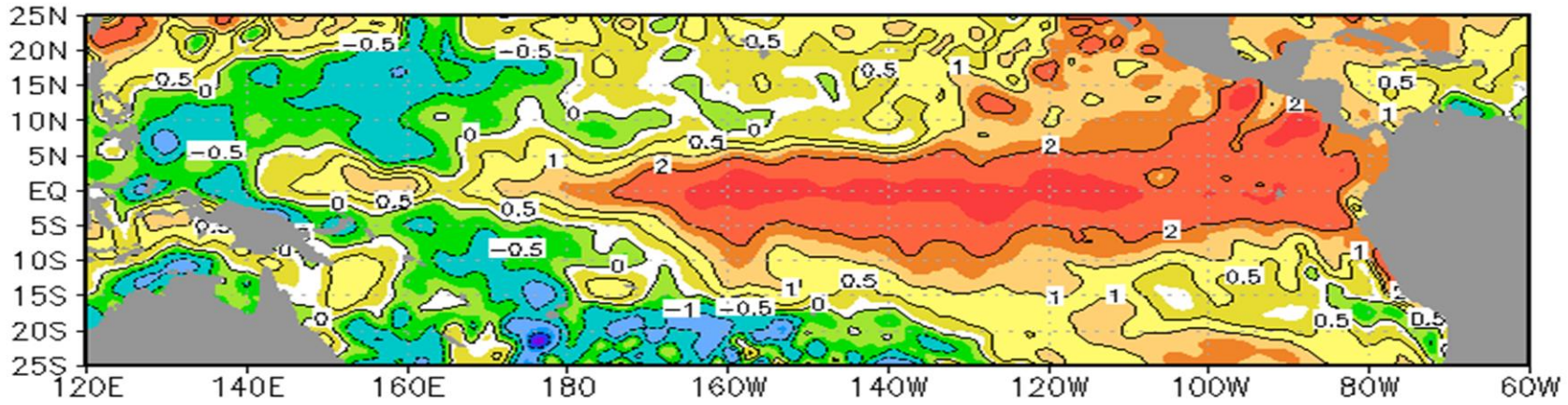

风云四号A星. 2021-03-27沙尘源地及移动路径示意图
沙尘
源地
27日3时
27日7时
27日10时
27日16时
27日11时
进入我国
蒙古
乌兰巴托
黑龙江省
吉林省
辽宁省
朝鲜
北京
北京市
天津市
河北省
宁夏回族自治区
山西省
山东省
韩国
青海省
中华人民共和国
甘肃省
陕西省
河南省
江苏省

El Nino /La Nino

El Nino year:

- 1982/1983
- 1997/1998
- 2015/2016

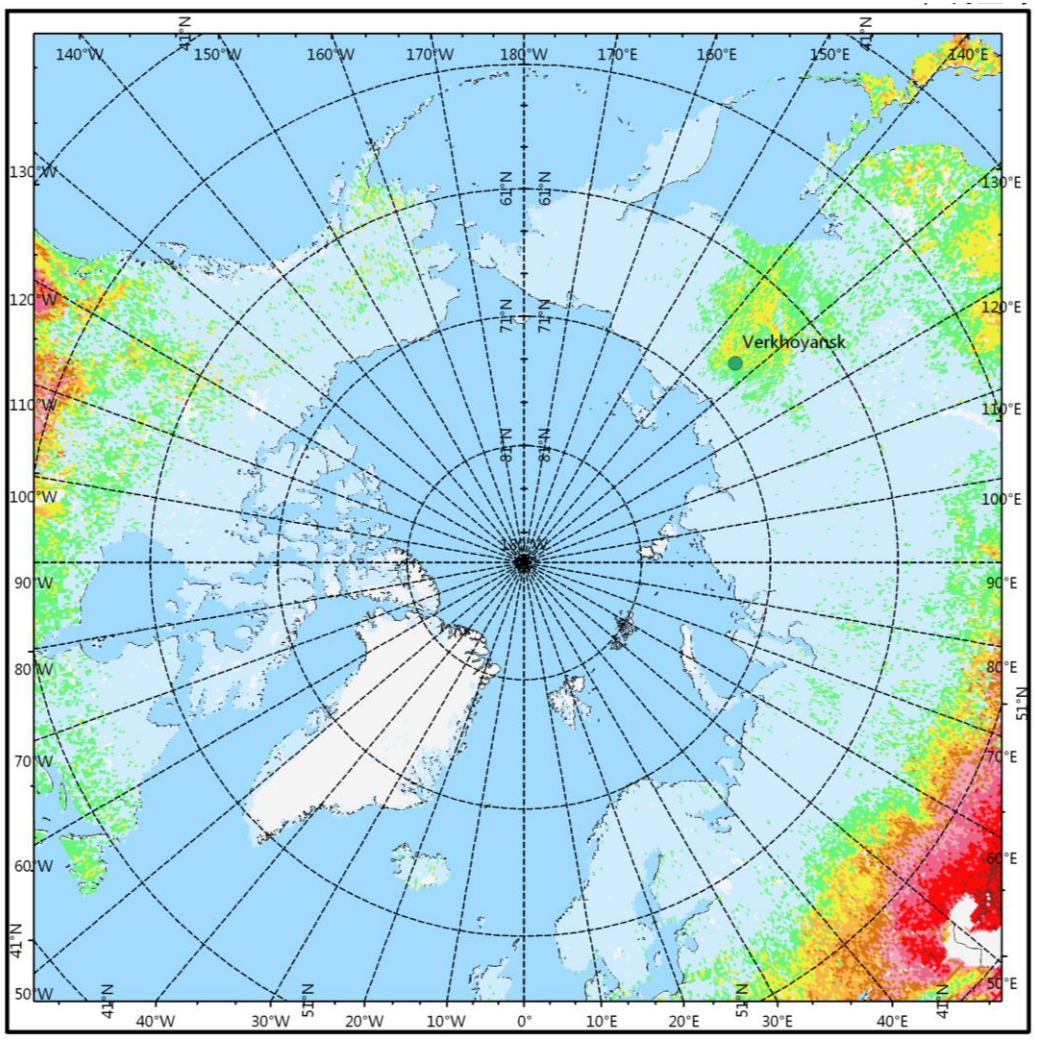




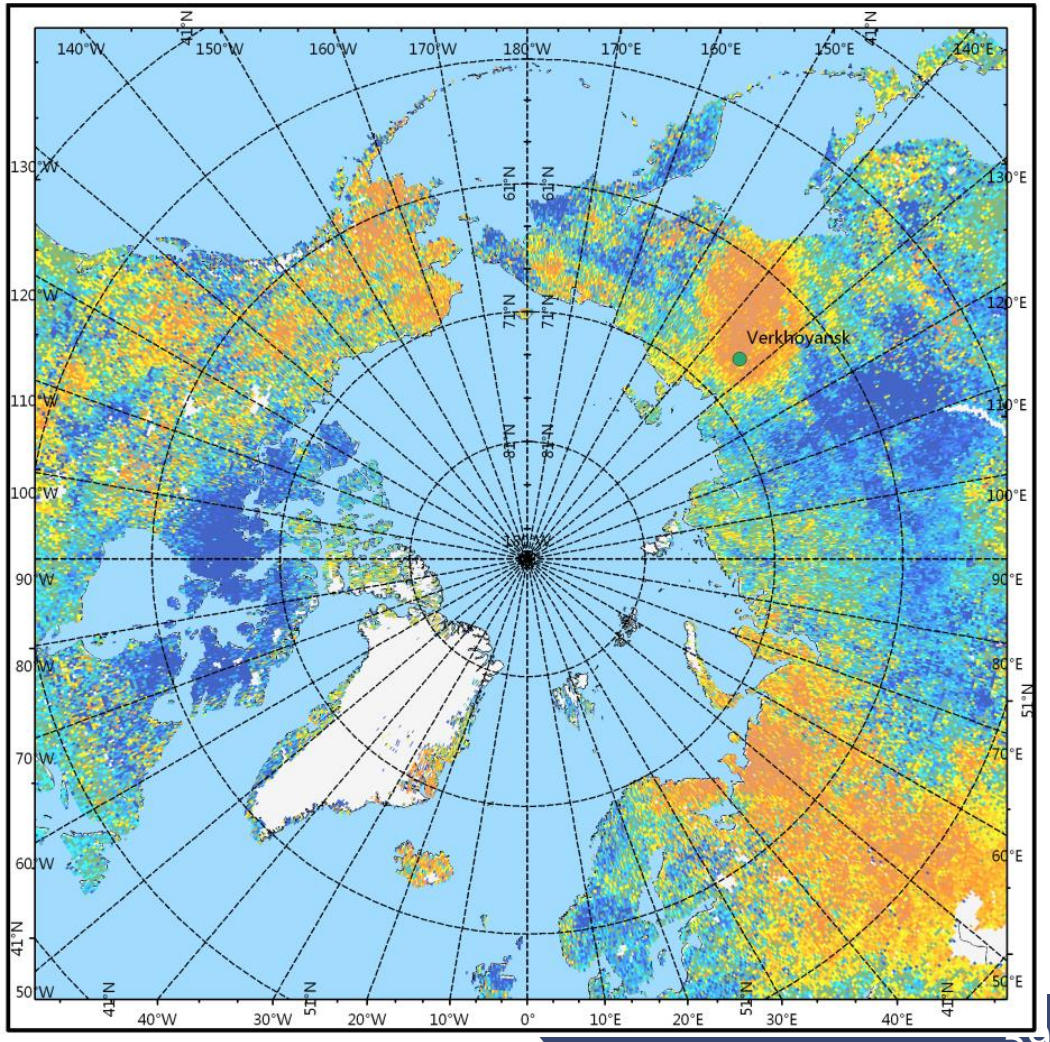
SST

Ground Surface Temperature

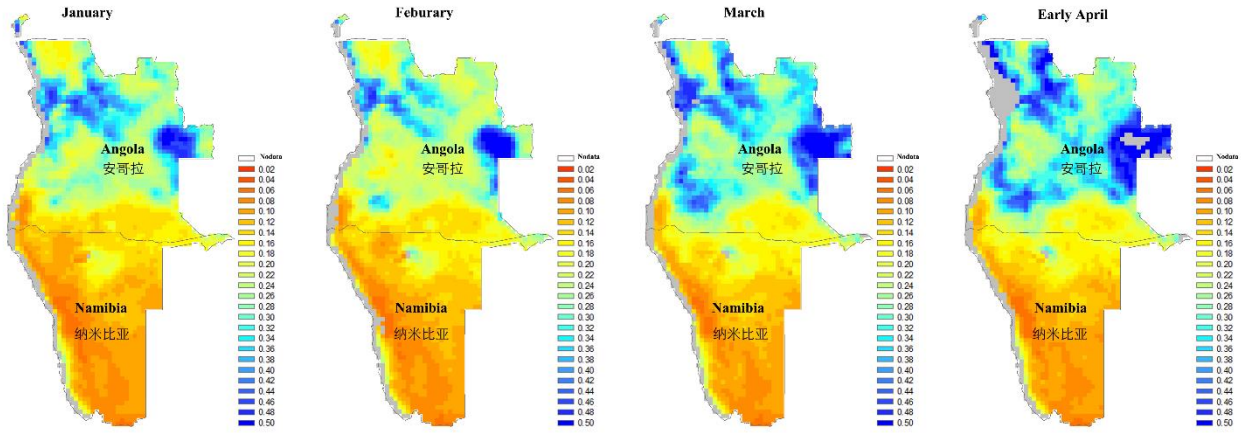
Ground surface temperature in the Arctic
Early August 2021



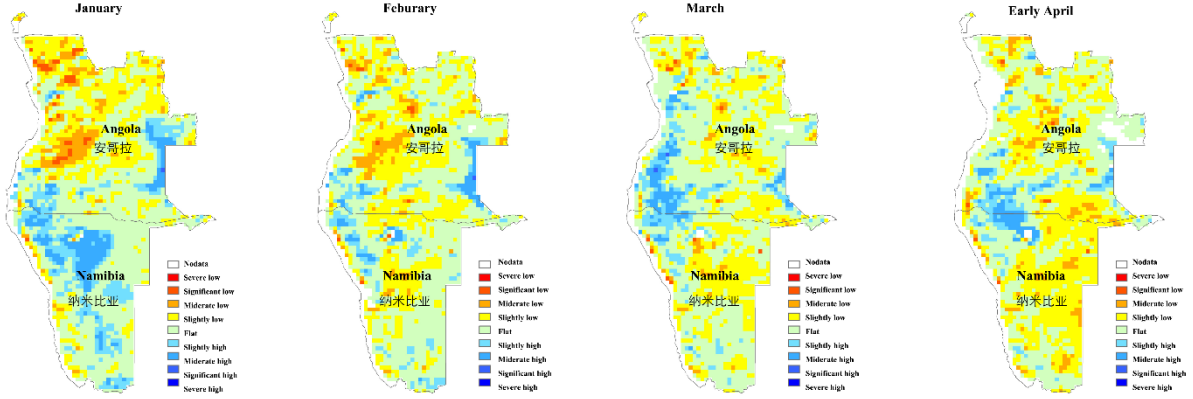
Ground surface temperature difference
2021V.S 2019-202 early August



Drought



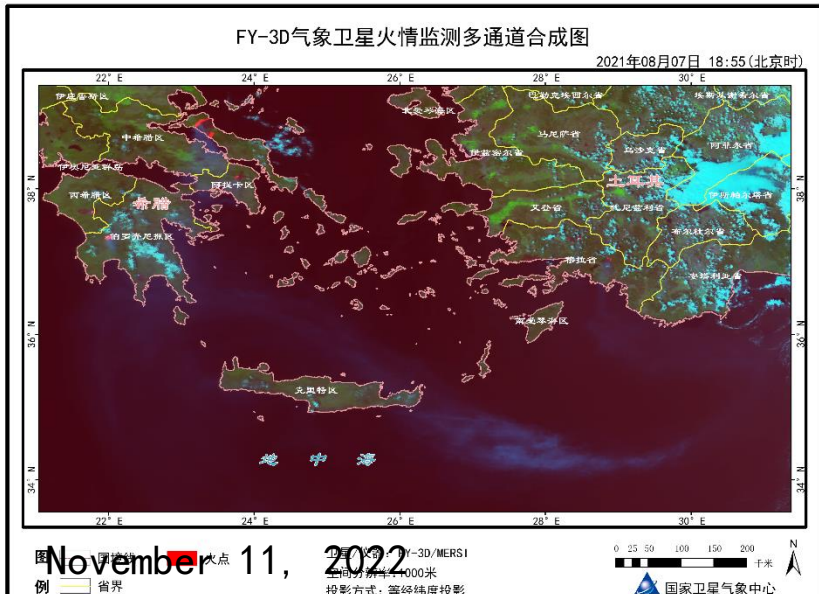
averaged soil moisture over Angola and Namibia from January to April, 2021

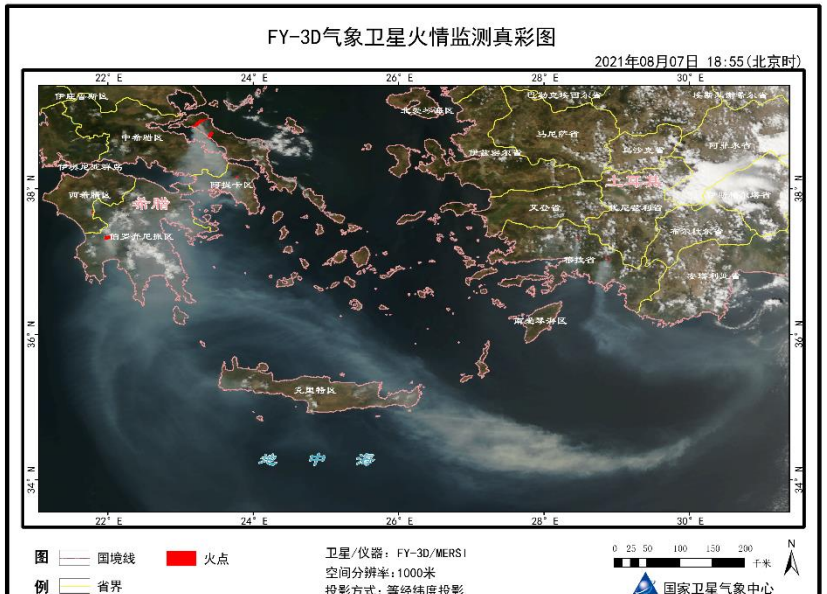


soil moisture anomaly over Angola and Namibia from January to April, 2021

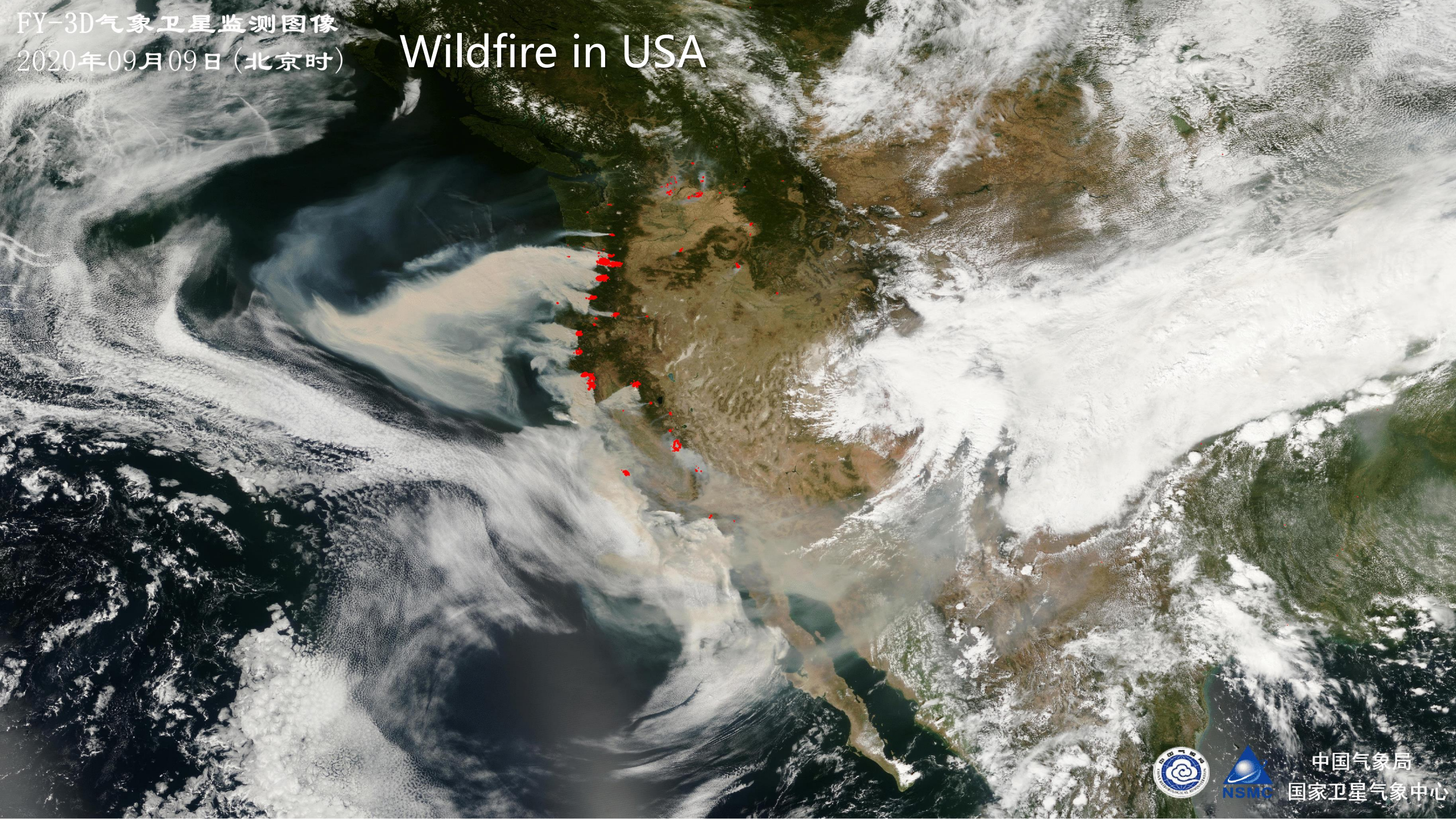
Global Hotpots and Wild Fires

- The FENGYUN satellite global fire monitoring system completes technical testing and will be published in the near future.

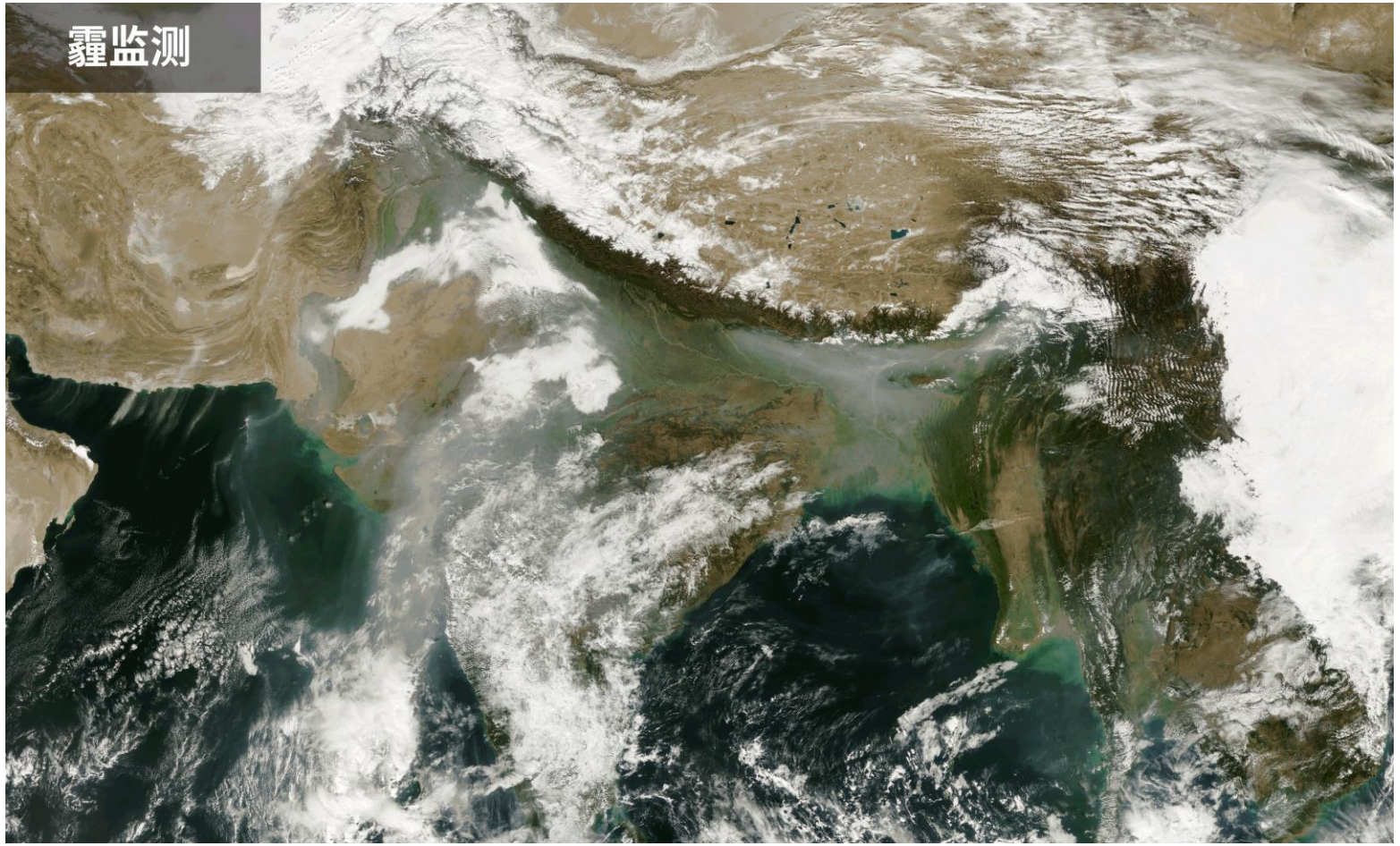


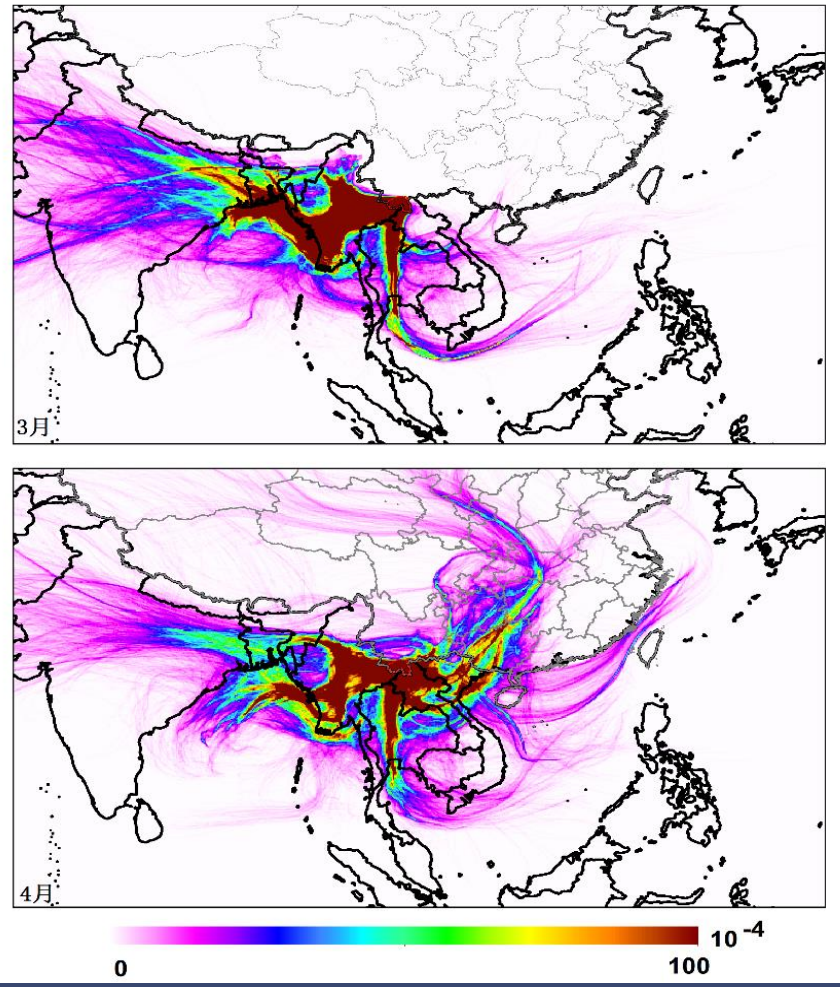


- Fires in Greece and Turkey (FY-3D)
- Simultaneous true-color composite overlay monitoring of the locations of the fires showed a large plume of smoke, which is blown by the wind into the Mediterranean Sea.

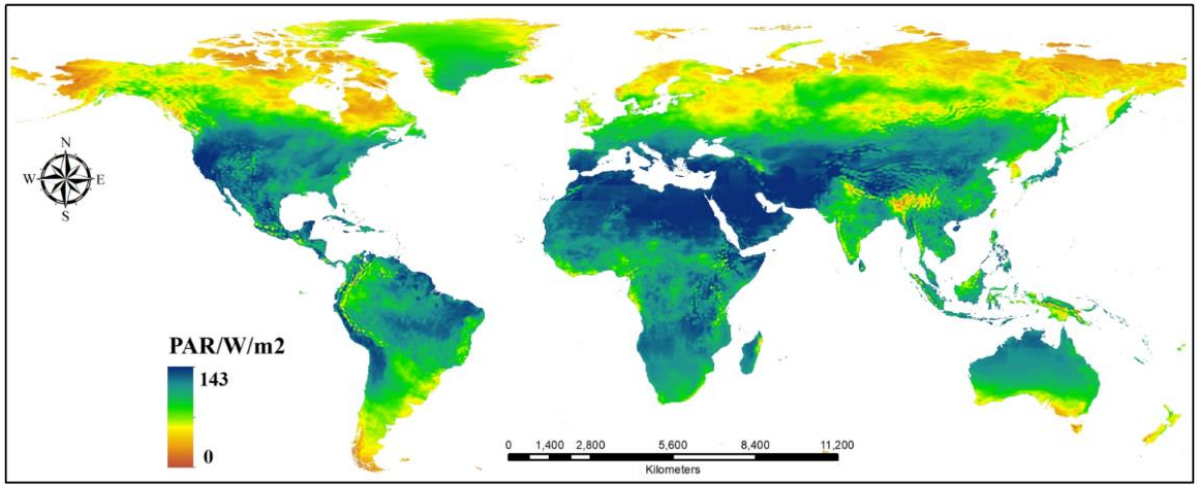

FY-3D气象卫星监测图像
2020年09月09日（北京时）
Wildfire in USA
中国气象局
国家卫星气象中心

Air Pollution

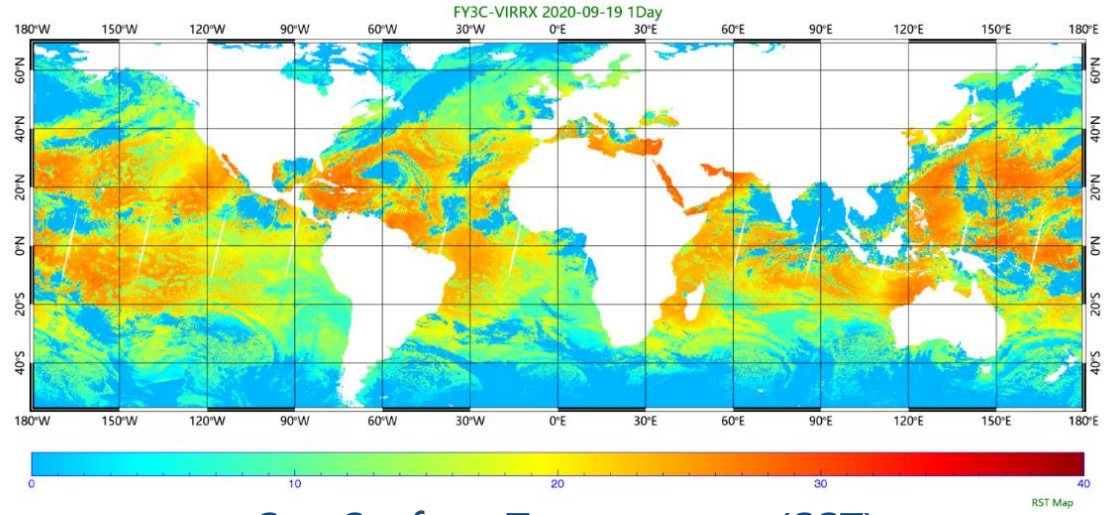




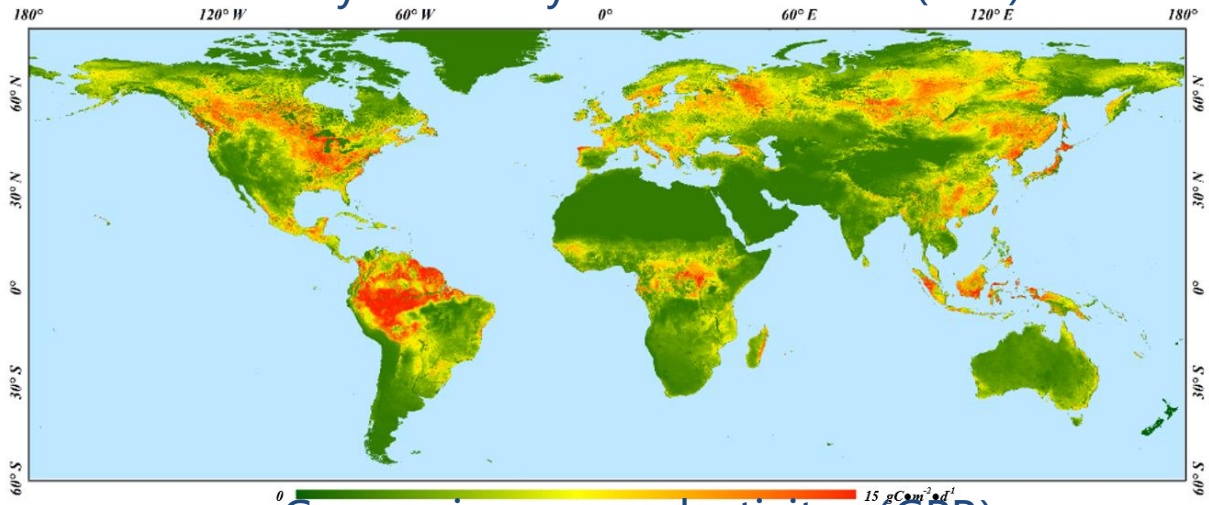
Global Applications



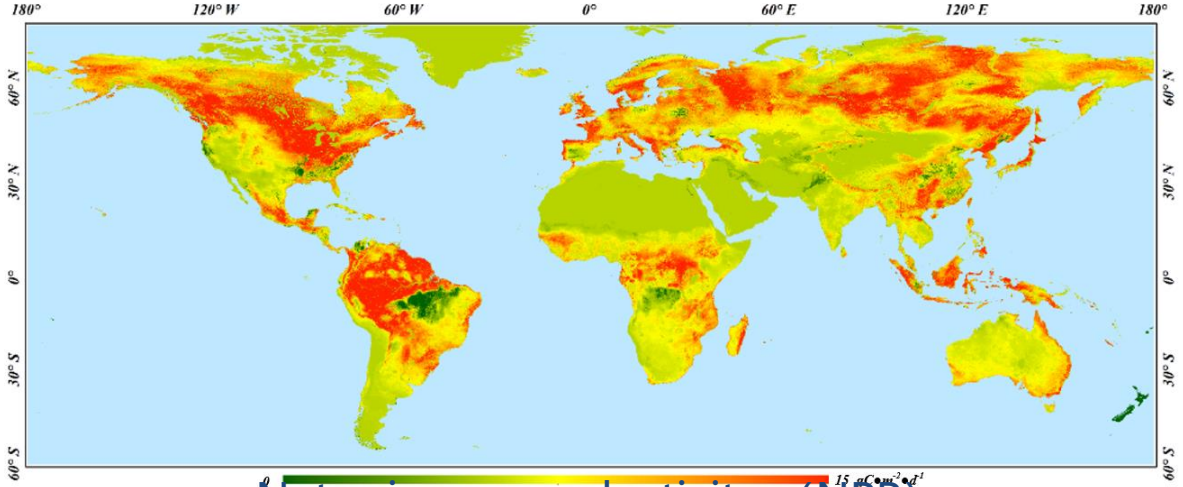
Photosynthetically Active Radiation(PAR)



Sea Surface Temperature (SST)



Gross primary productivity (GPP)

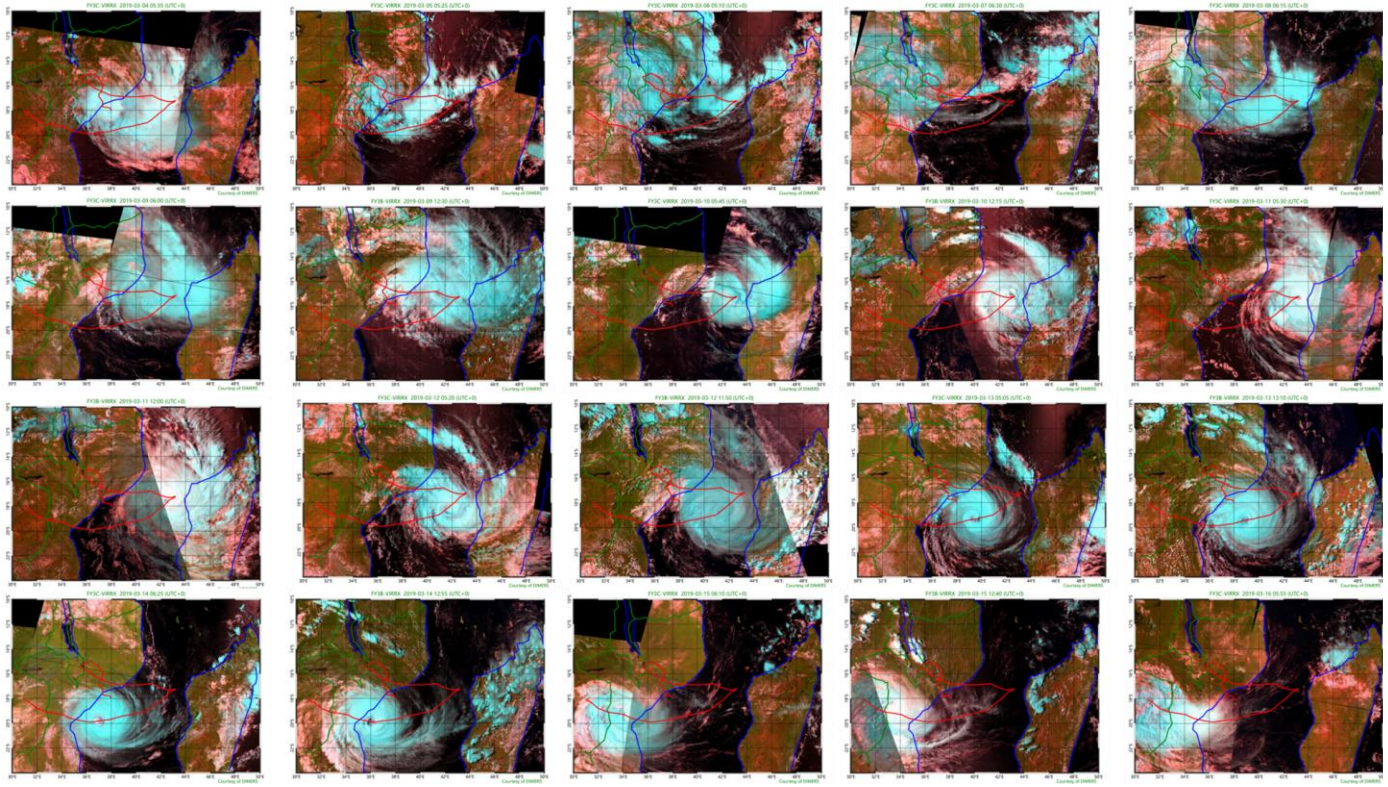


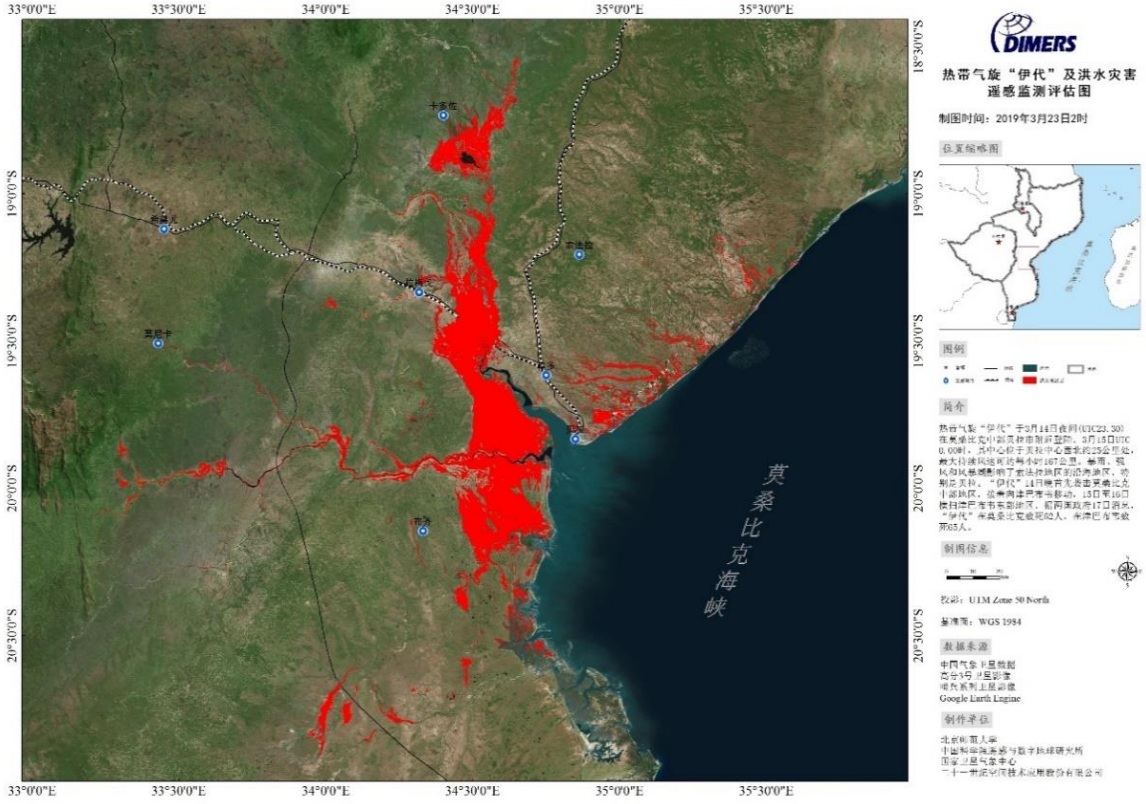
Net primary productivity (NPP)

Disaster Evaluation - Flood

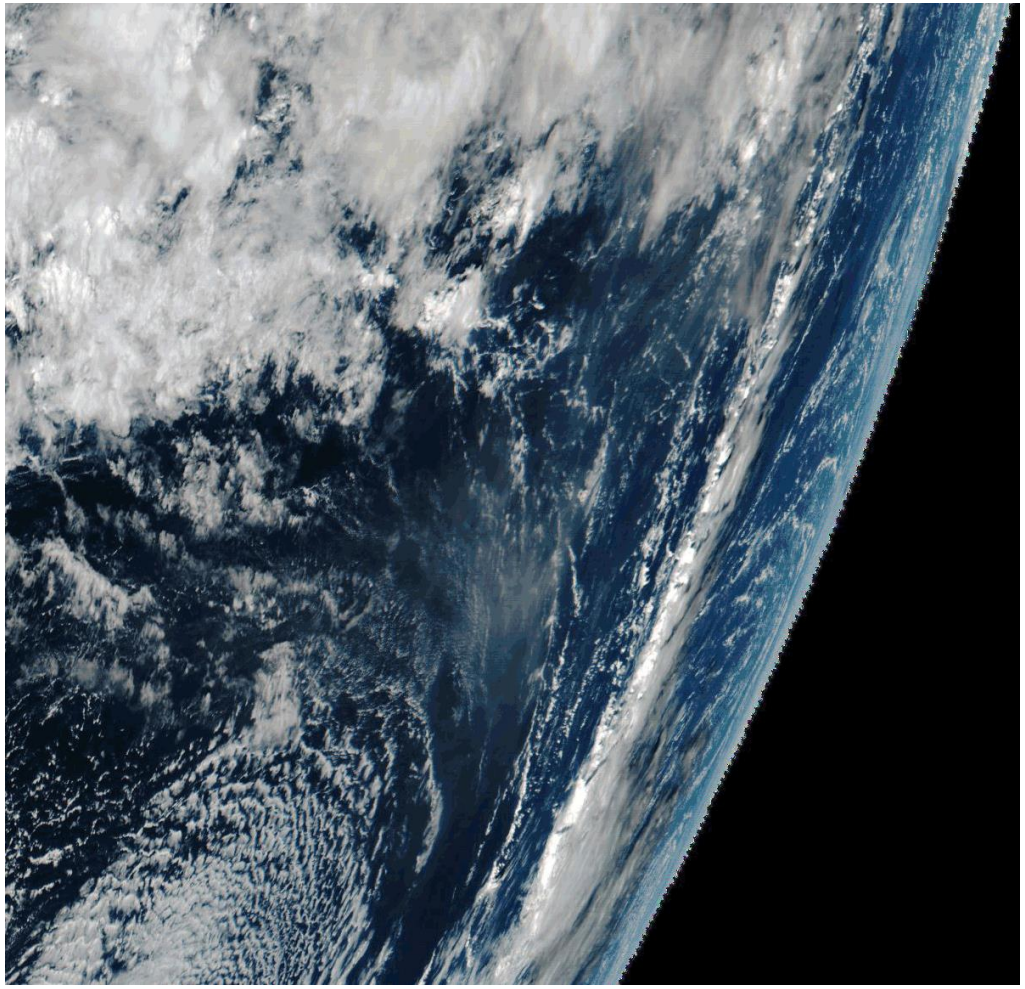
FY satellites monitor tropical cyclone IDAI over the southwest of Indian Ocean

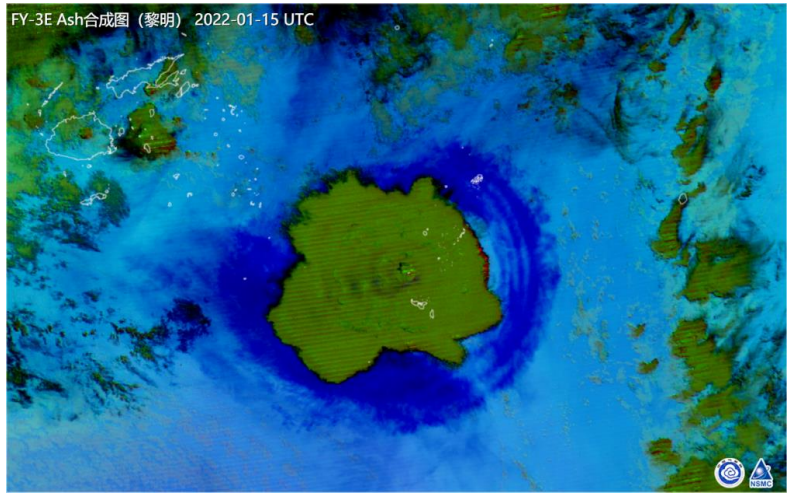
Assessment of flood disaster with high resolution remote sensing images

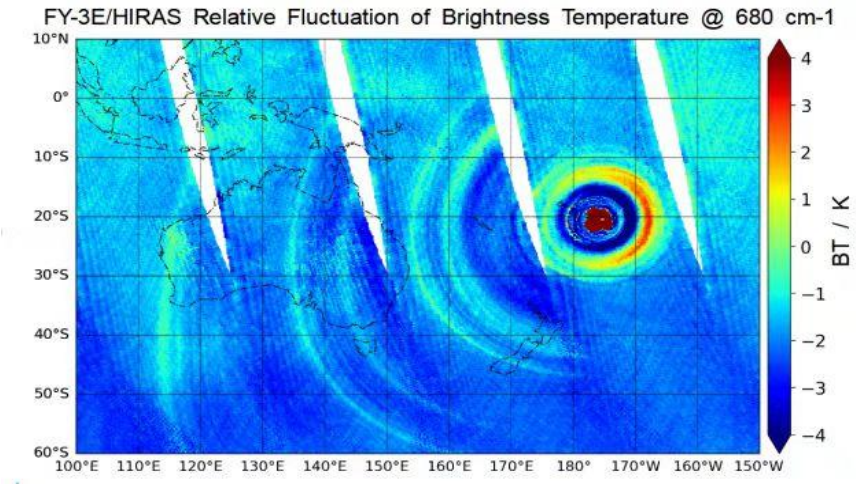




Volcano Analysis

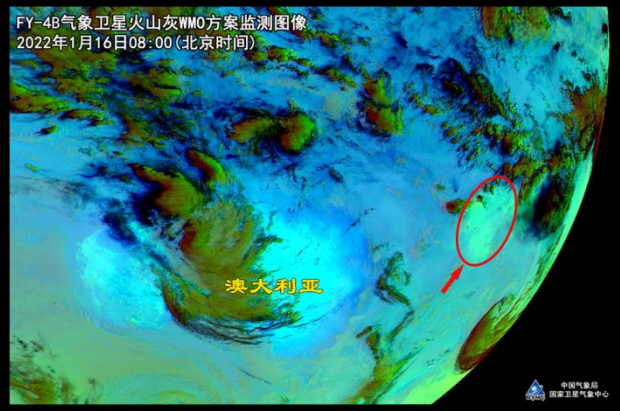


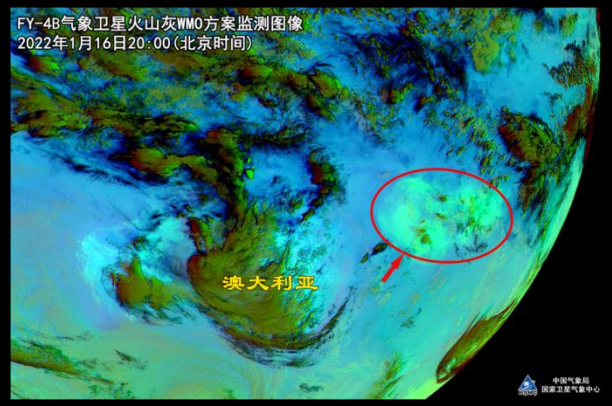


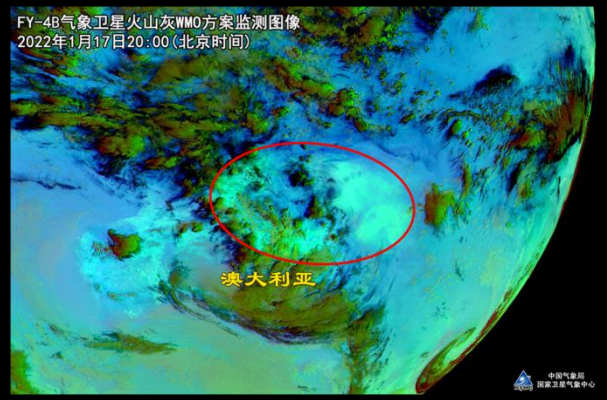


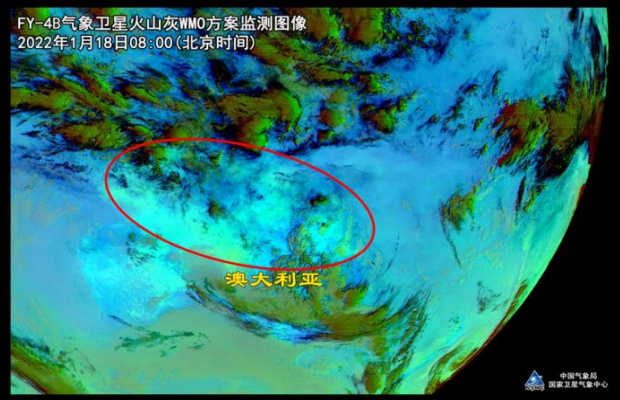
Volcano Analysis

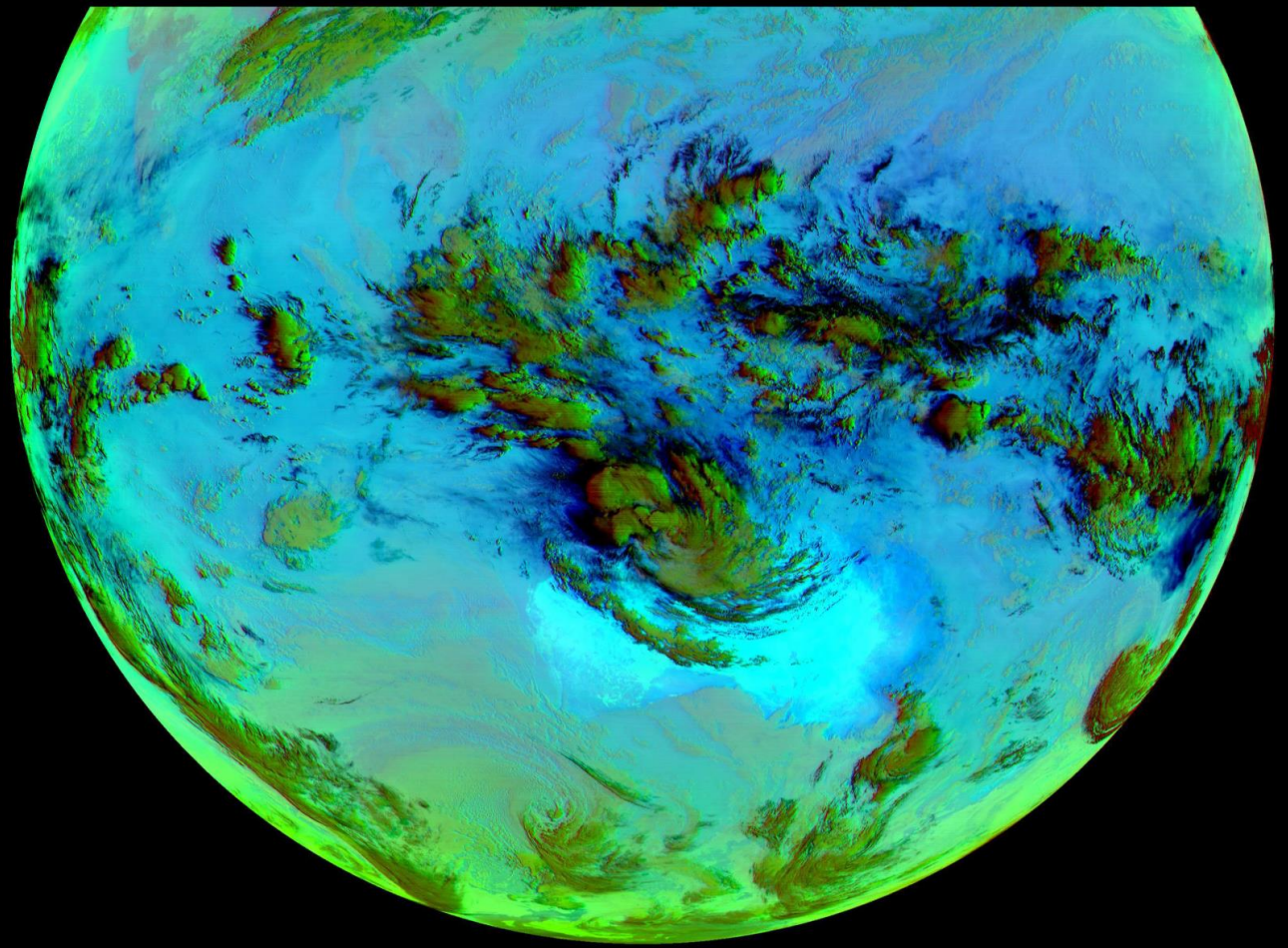
Volcano ash transmission



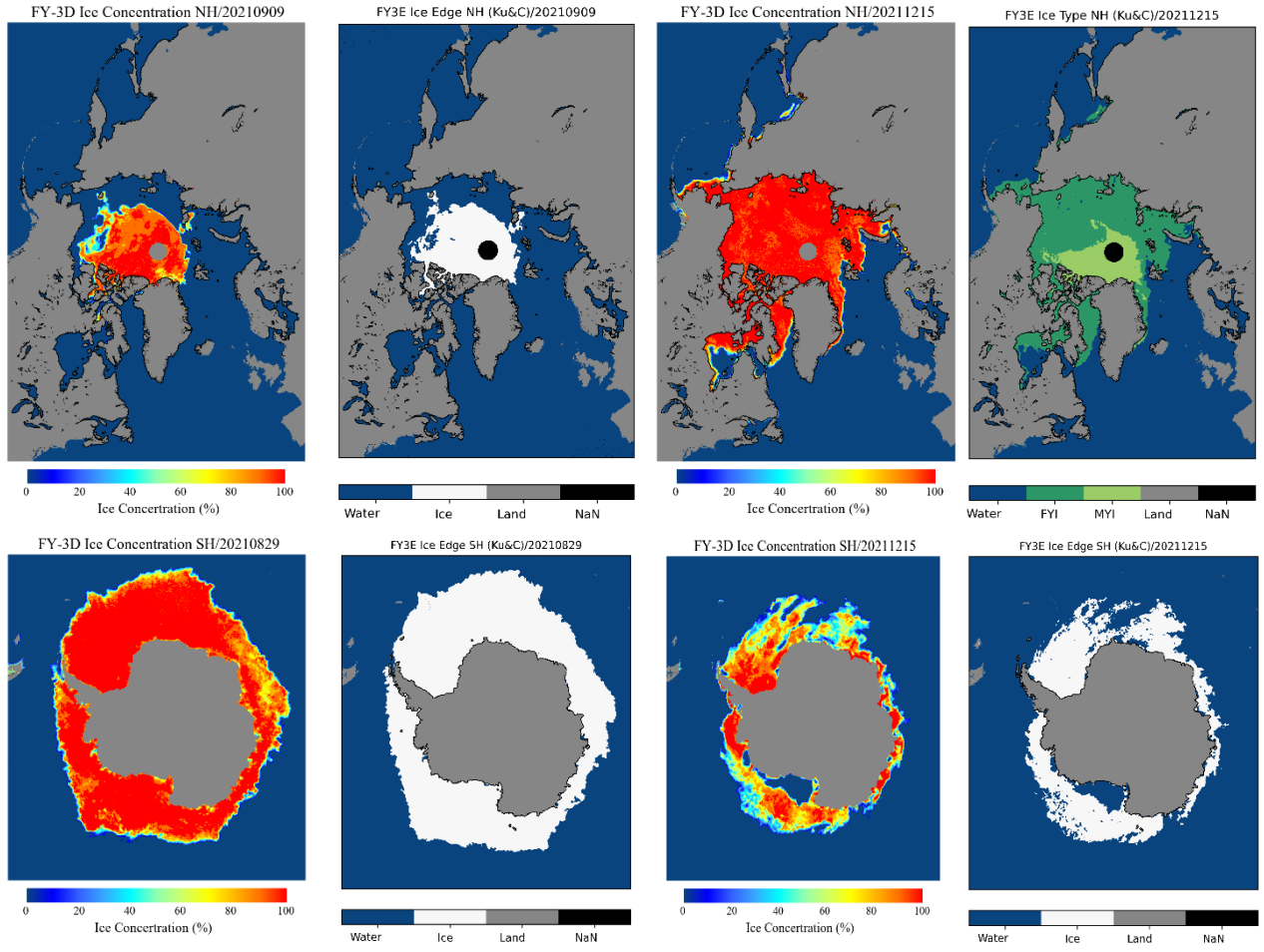


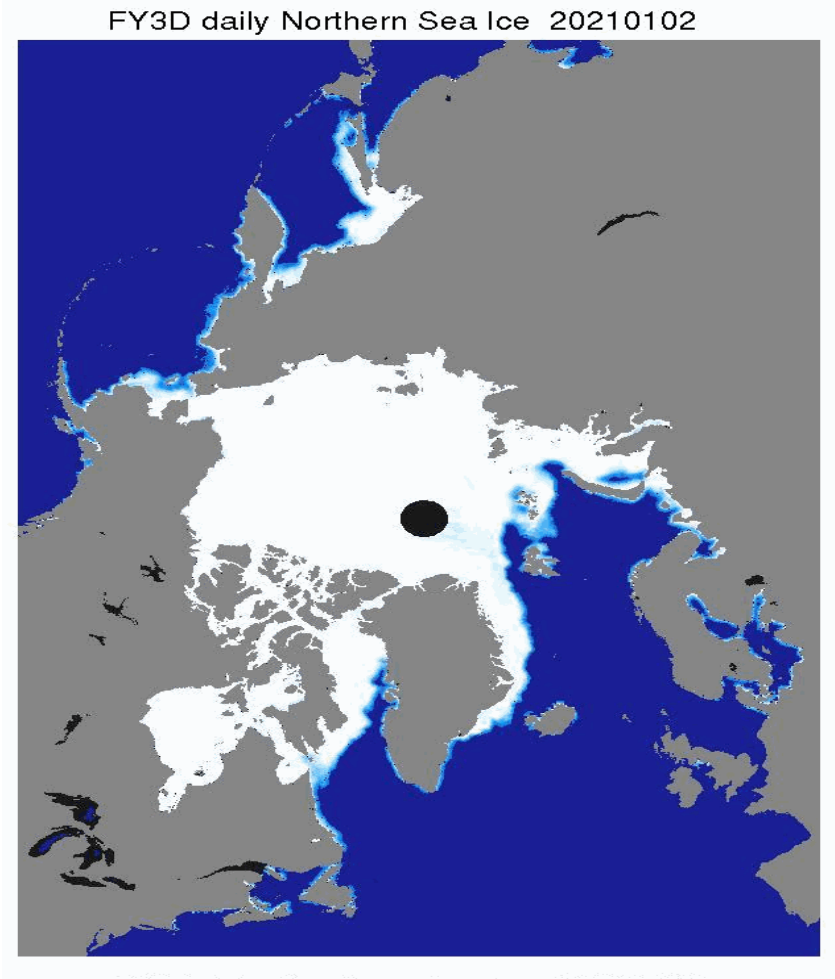






Ice


FY-3D Ice Concentration NH/20210909
FY3E Ice Edge NH (Ku&C)/20210909
FY-3D Ice Concentration NH/20211215
FY3E Ice Type NH (Ku&C)/20211215
0 20 40 60 80 100
Ice Concentration (%)
Water Ice Land NaN
Water FYI MYI Land NaN
FY-3D Ice Concentration SH/20210829
FY3E Ice Edge SH (Ku&C)/20210829
FY-3D Ice Concentration SH/20211215
FY3E Ice Edge SH (Ku&C)/20211215

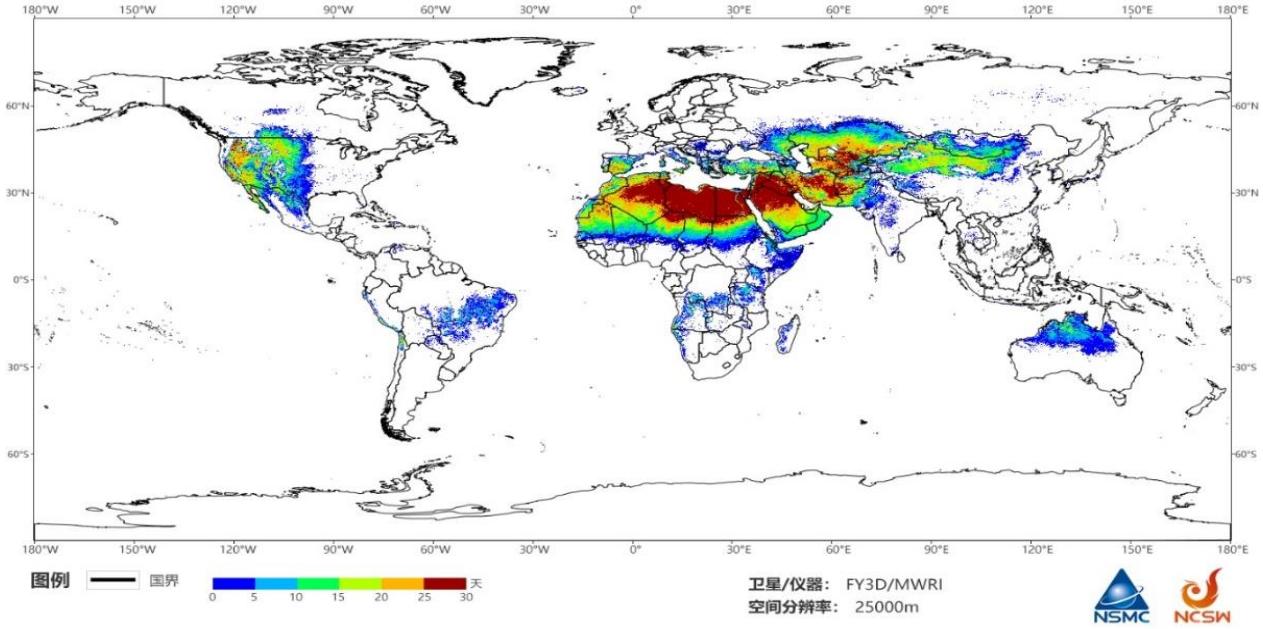

FY3D daily Northern Sea Ice 20210102

Outline

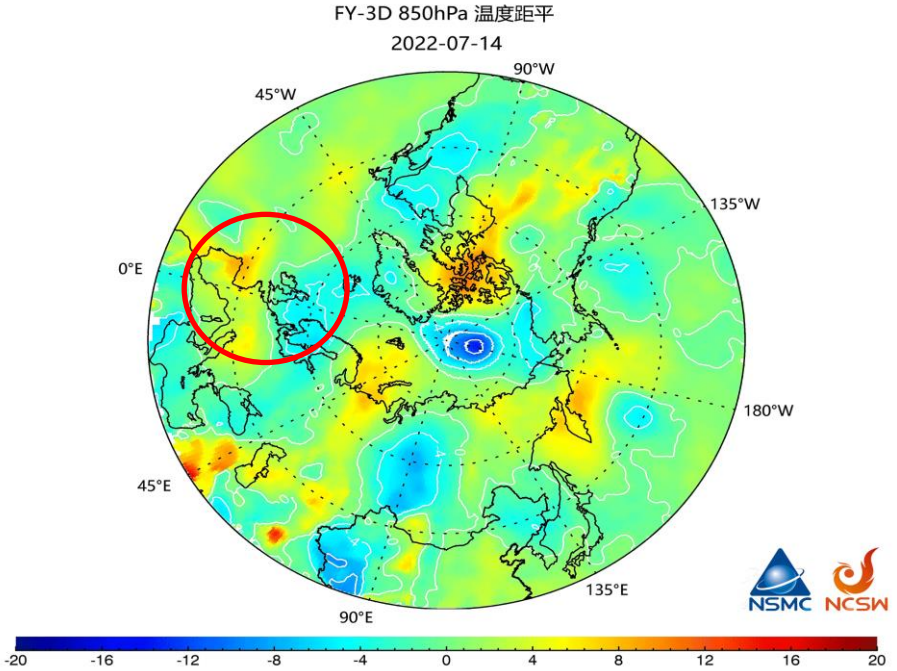
1. Fengyun Program Overview
2. Data, products and services to B&R countries
3. Typical Applications
4. Case Studies with multiple satellites
5. Actions and plans

Land surface temperature

The extreme heat in the Northern Hemisphere from June to July this year set record temperatures and durations in many cities around the world. The area of high surface temperature with average surface temperature above 40℃ and above 50℃ accounted for 16.8% and 7.4% of the world. Northern Africa, the Middle East, Central Asia, Central and western North America, and southern Europe experienced surface high temperatures greater than 40℃ for more than 20 days. Compared with the same period last year, 55.9% of the world's surface temperature was 0-5℃ higher.



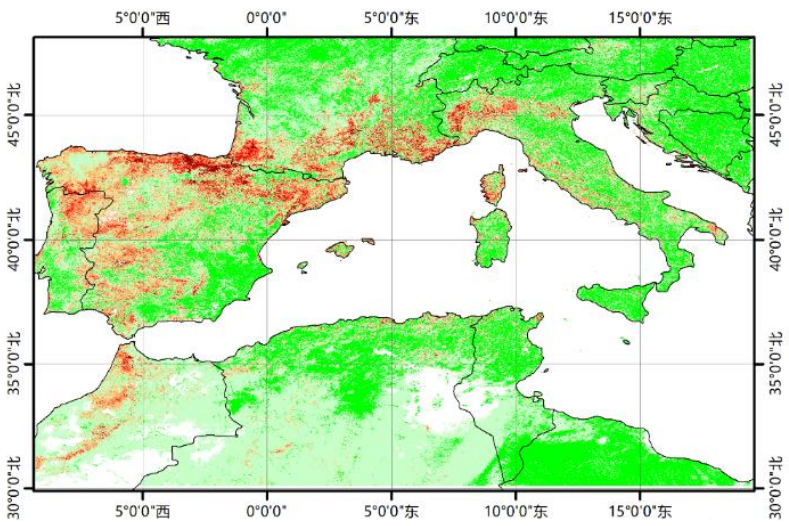
FY-3D Global High Temperature Days in July (>40℃)



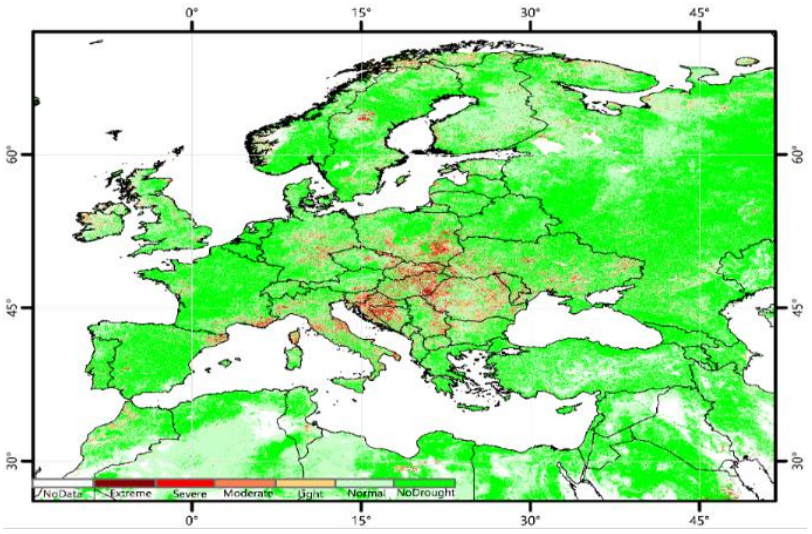
FY-3D 850hpa temperature anomaly （14-19 July，2022）

Drought in Europe

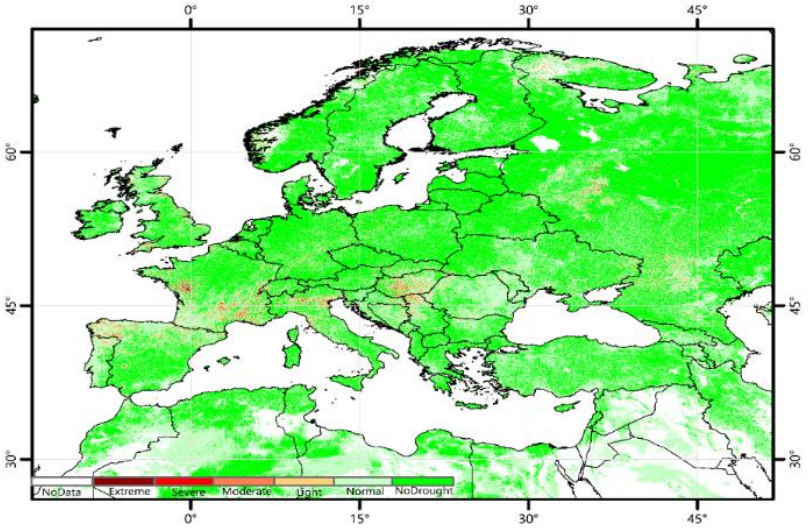
In late June this year, affected by the continuous high temperature, southern Europe appeared a serious drought, including northern Portugal, western and northern Spain, southern France, northern Italy are in a severe drought state. In early July, severe drought occurred mainly in Eastern European countries, in southern Poland, Slovakia, Hungary, Croatia, Bosnia and Herzegovina and Romania. By early August, the drought had eased in Europe.



Late June



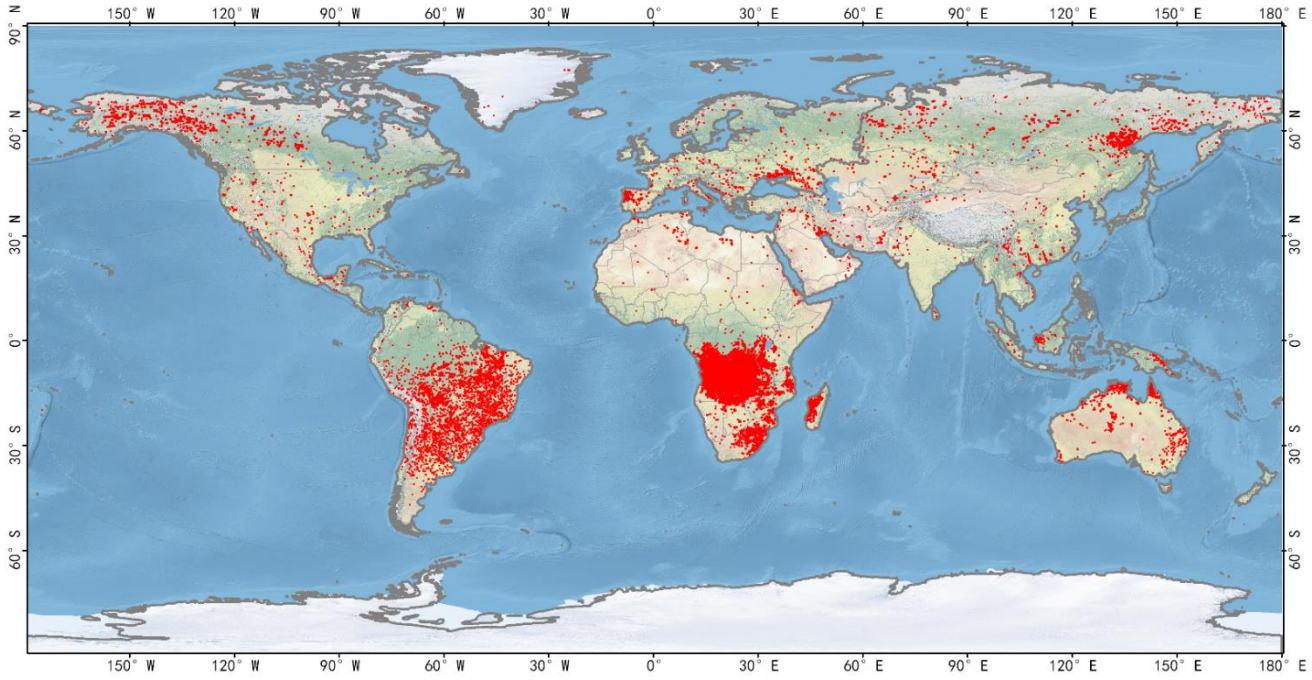
Early July



Early August

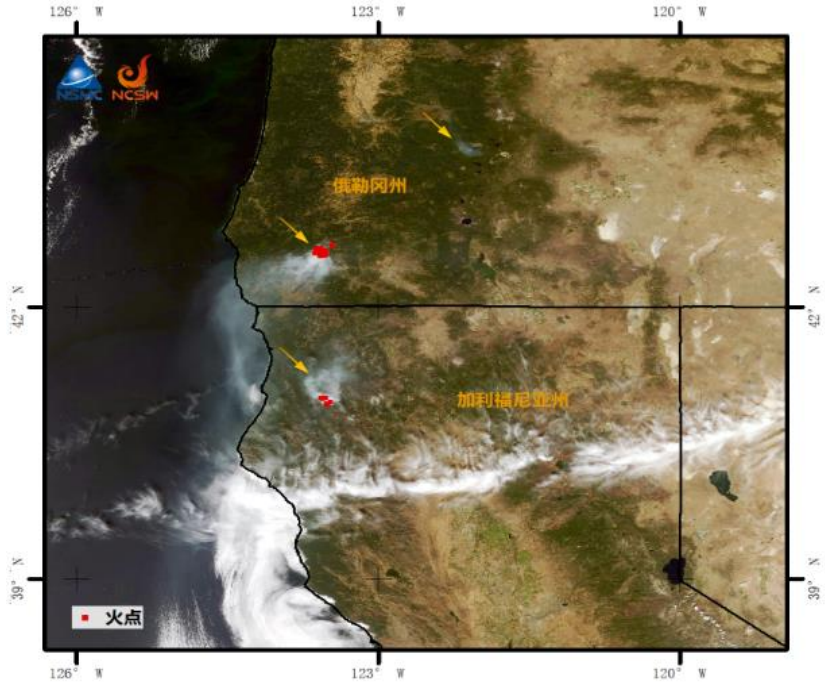
1) Global Extreme High-temperature

Global Wildfire Event Rise



Global wildfire by FY-3D (July, 2022)

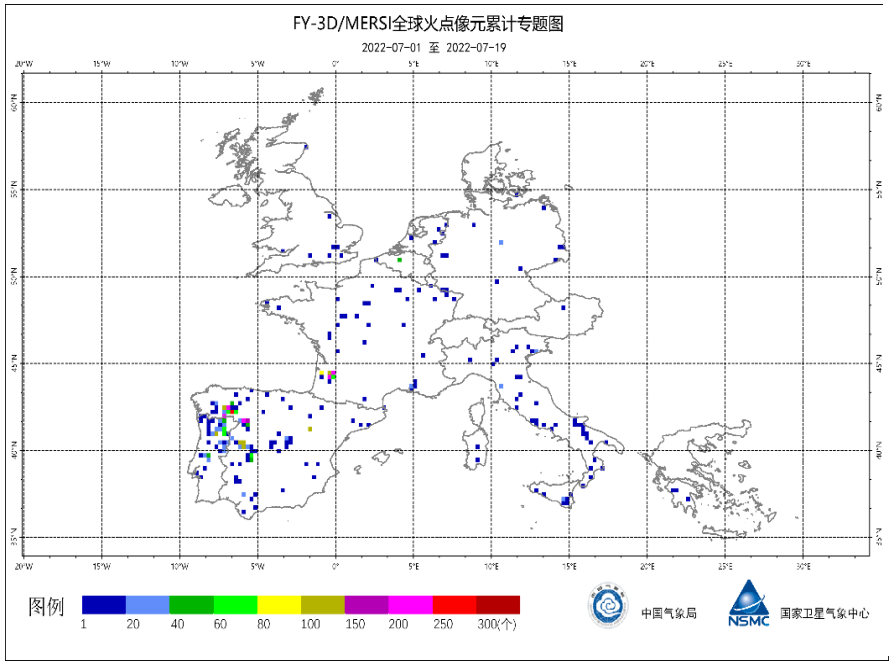
A total of 253,000 fires were monitored globally in July, an increase of 111,000 (78%) over June, among which 203,000, 36,000 and 6,000 were in woodland, grassland and farmland, accounting for 80.5%, 14.2% and 2.5% of the global total, respectively.

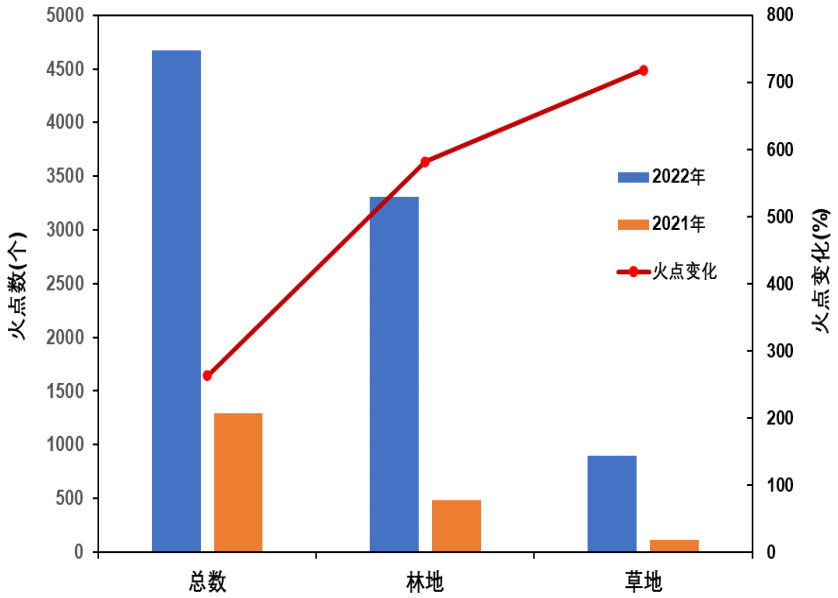


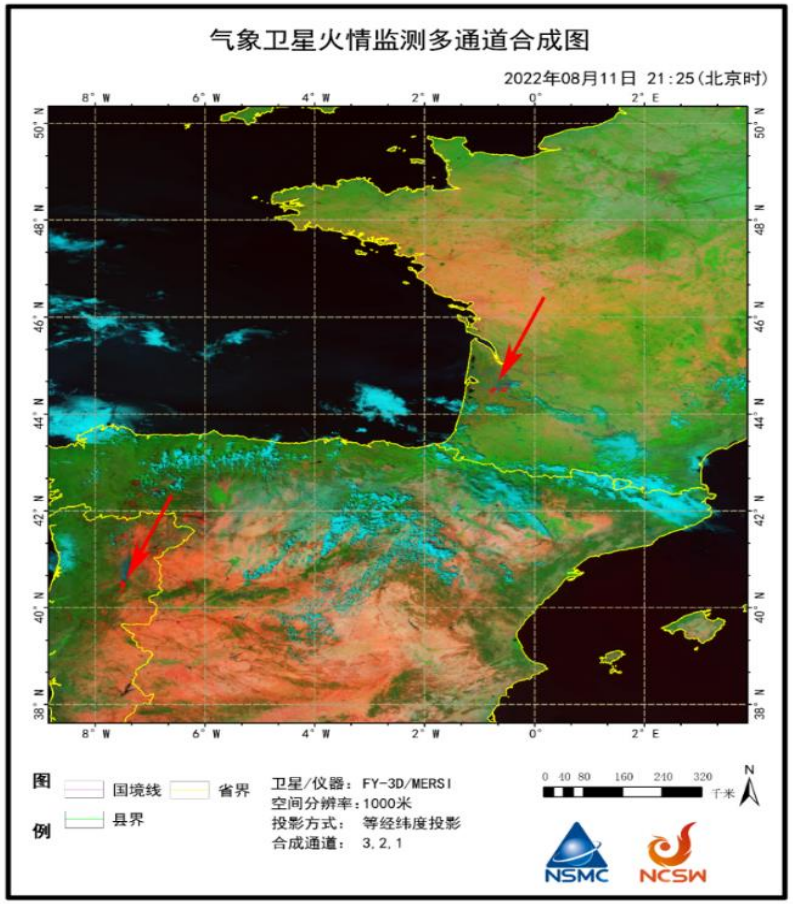
Wildfire in western USA

Europe Wildfire

In July, the total number of fire points in Western Europe showed a gradual increase. On the 13th, the number of fire points began to increase significantly. On the 15th, the number of fire points in Western Europe soared to 787, 11 times of the same period last year; on the 16th, the number of fire points decreased to 295, still 5.4 times of the same period last year; on the 17th, the number of fire points increased to 596, 11 times of the same period last year. On the 18th, the number of fire points increased to 1,251, 21 times that of the same period last year. On the 19th, the number of fire points decreased to 612, 19.4 times that of the same period last year.



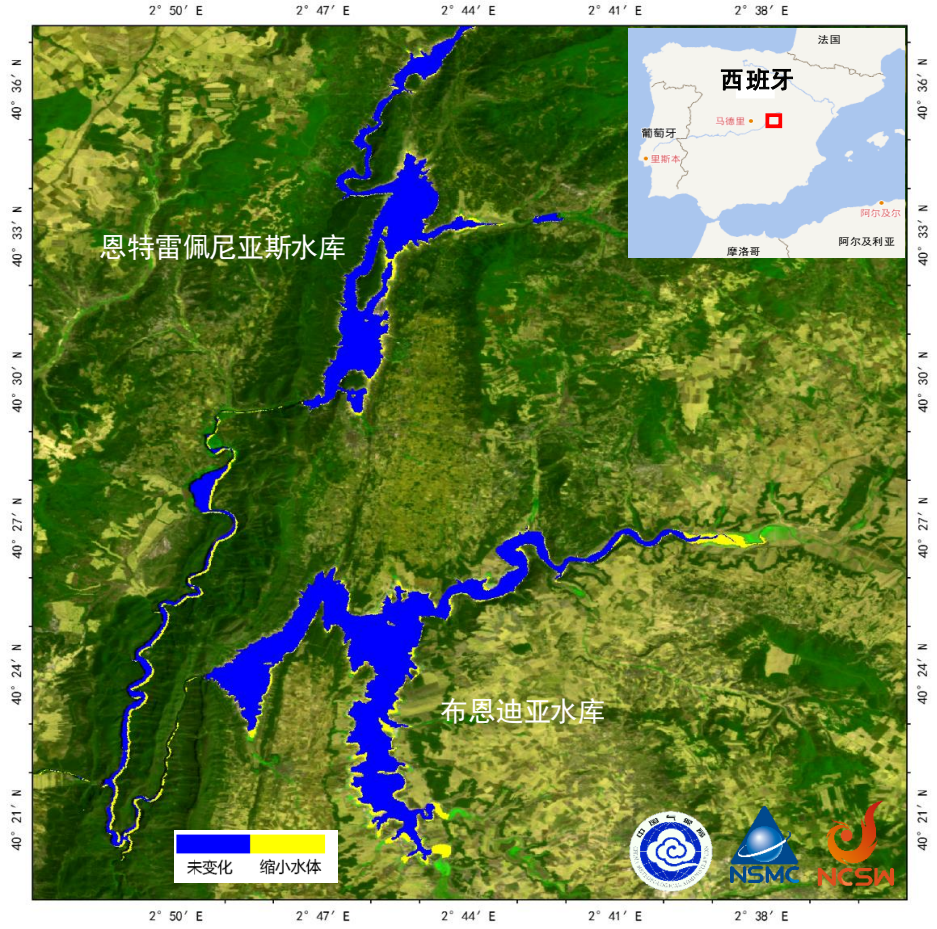




1) Global Extreme High-temperature

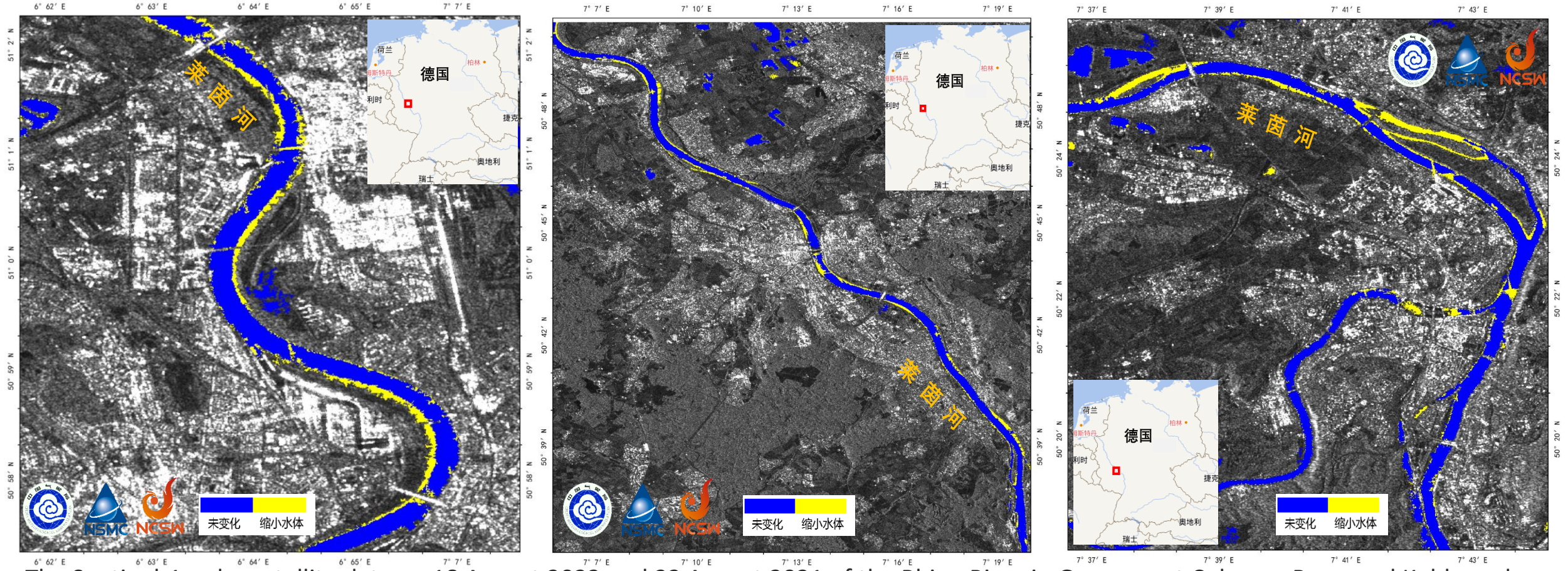
Water Body Change

The Gaofen-1 satellite monitoring of Spain's Entrepenias Reservoir and Buendia Reservoir on August 9, 2022 and August 16, 2021 showed that the water area of the two reservoirs decreased by about 4.8 square kilometers compared with the same period last year. Monitoring of Spain's Alacon reservoir shows that it is about 1.2 square kilometers less water than it was this time last year.



1）Global Extreme High-temperature

Water Body Change



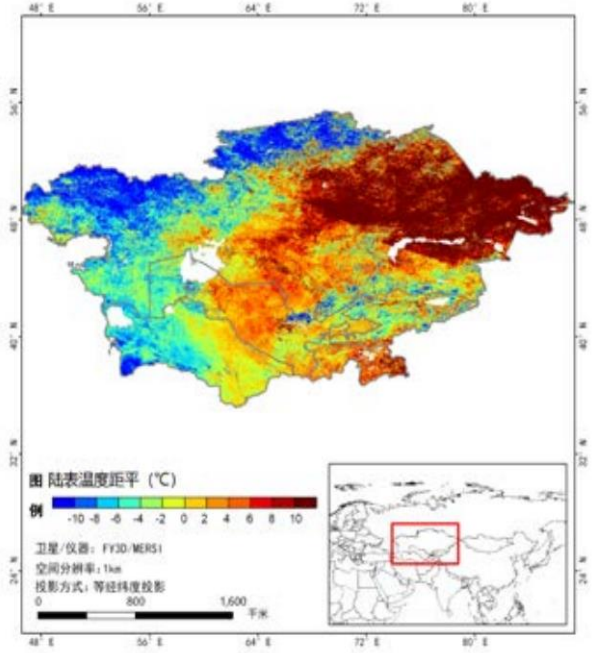
The Sentinel-1 radar satellite data on 18 August 2022 and 23 August 2021 of the Rhine River in Germany at Cologne, Bonn and Koblenz showed a reduction of about 1.6 square km in Cologne and 4.2 square km in Bonn, respectively. The Koblenz section lost about 3.2 square kilometers.

1）Global Extreme High-temperature

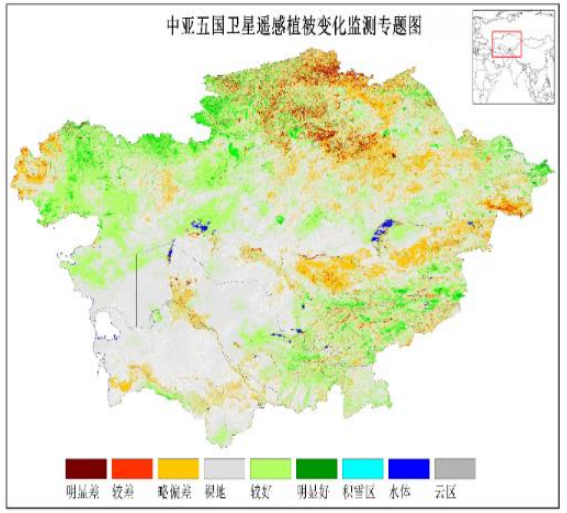
Asia high-temperature

Central Asia

In late June, the surface temperature in central and northeastern Central Asia was more than 10℃ higher than that in the same period of last year, and the vegetation growth was deviated.



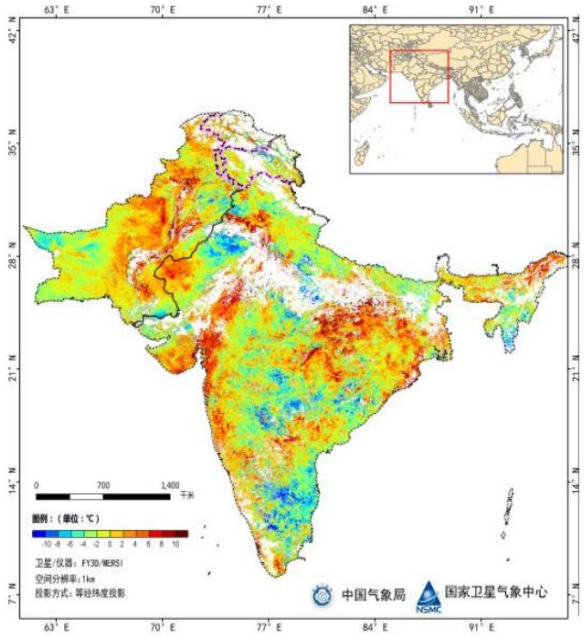
地表高温同比差值图



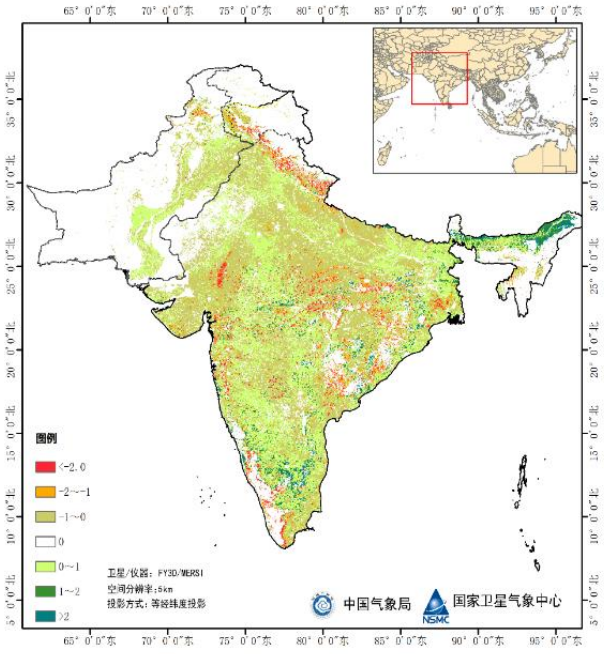
植被变化监测图

India and Pakistan

The leaf area index showed a deviation trend in central, eastern and western India, and the deviation area was basically consistent with the area with high surface temperature of 4℃.

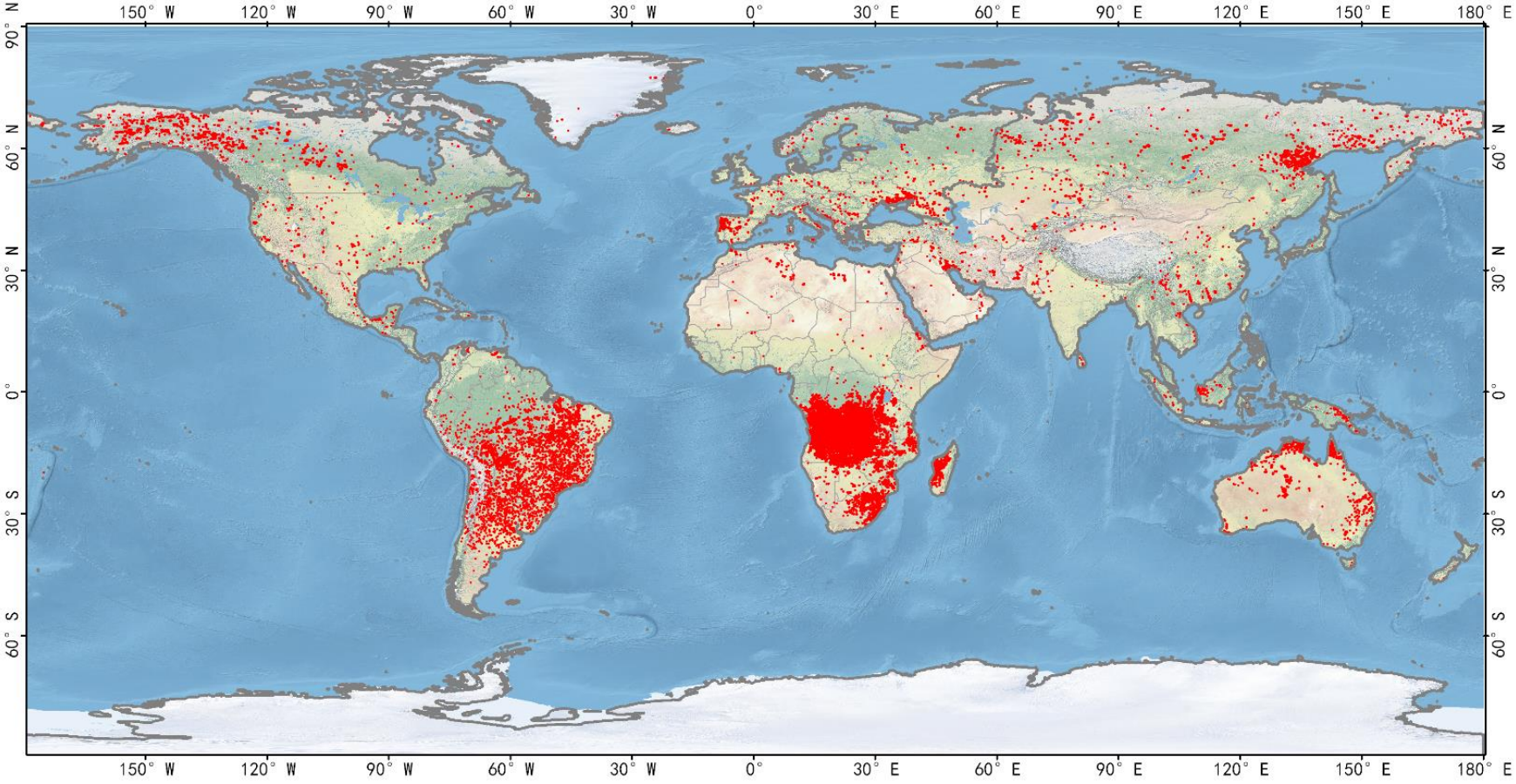


LST difference



LAI difference

Global wildfire events rise

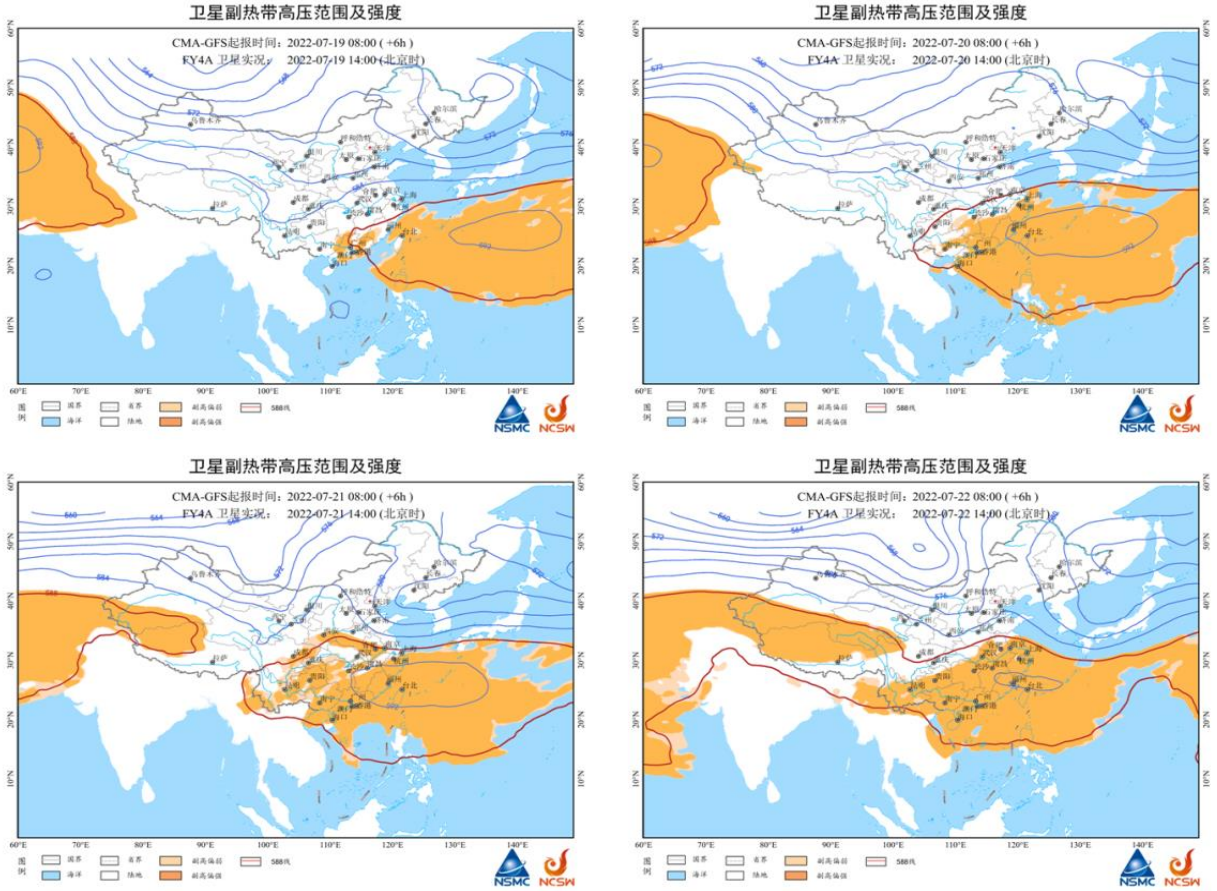


A total of 253,000 fires were detected worldwide in July, an increase of 111,000 (increase 78%) compared with June, of which 203,000, 36,000 and 6,000 fires were detected in woodland, grassland and cultivated land, accounting for 80.5%, 14.2% and 2.5% of the global total, respectively

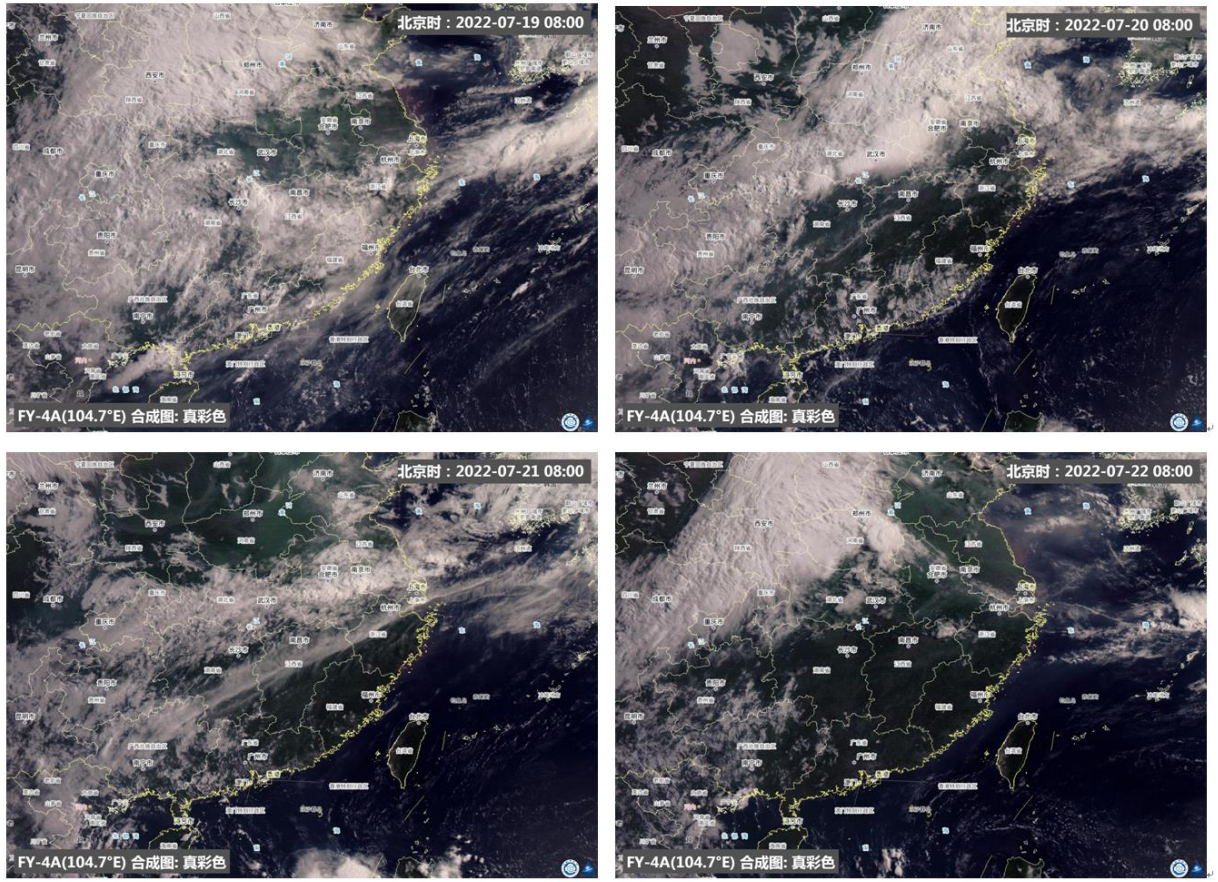
2）Precipitation

A strong precipitation event in Southeast China

Northwest Pacific subtropical high identification

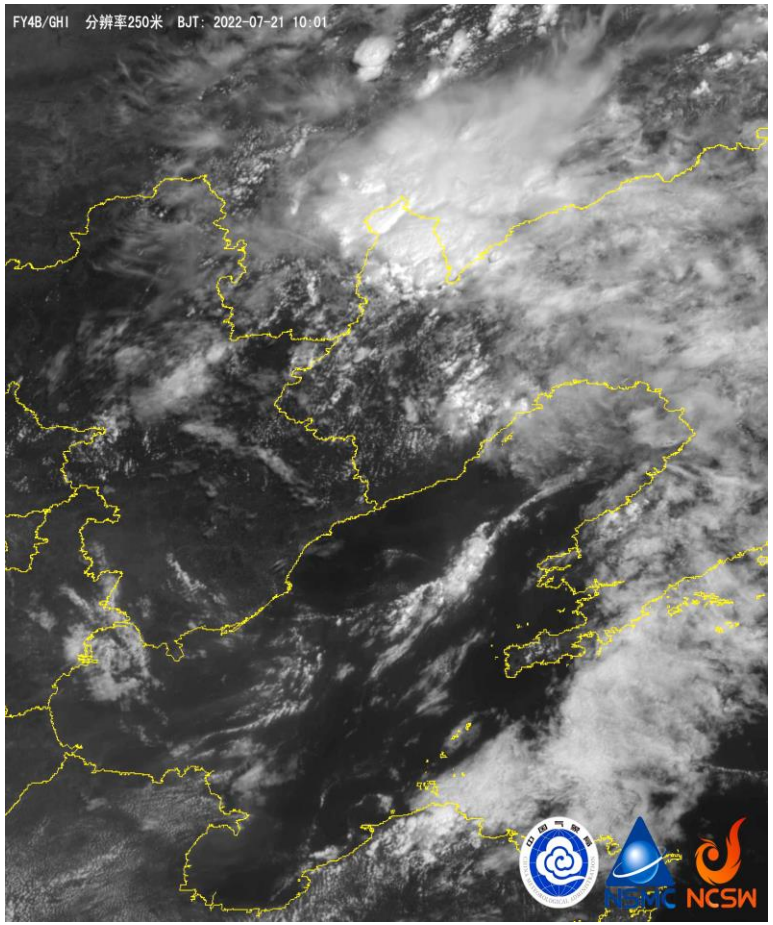


FY-4A true color image

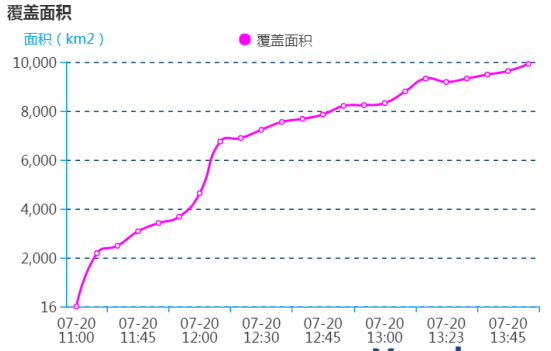


2）Precipitation

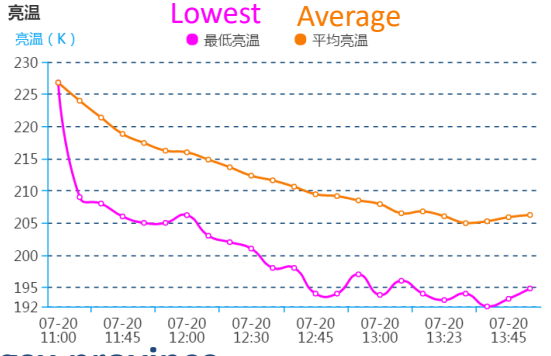
FY-4B GHI animation



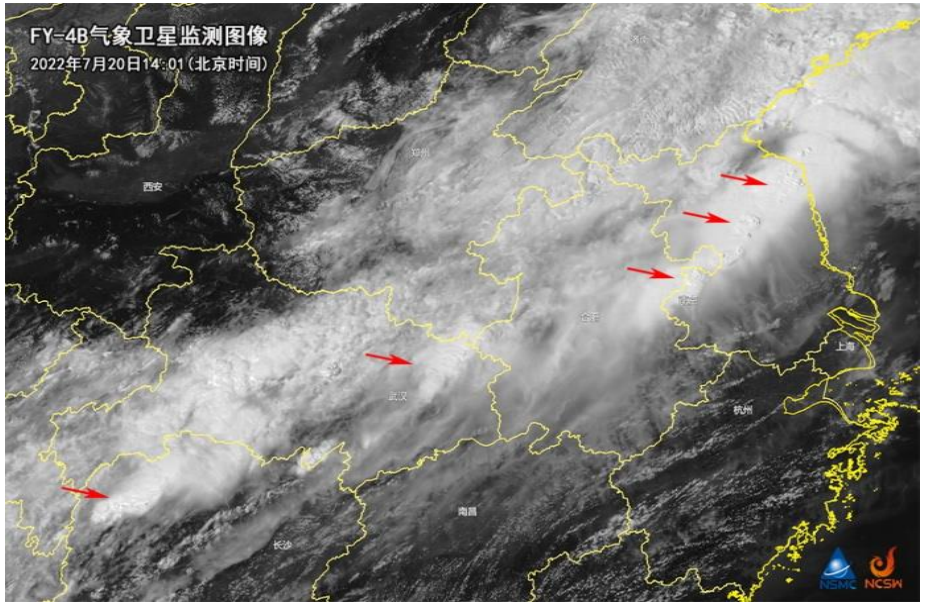
MCS area

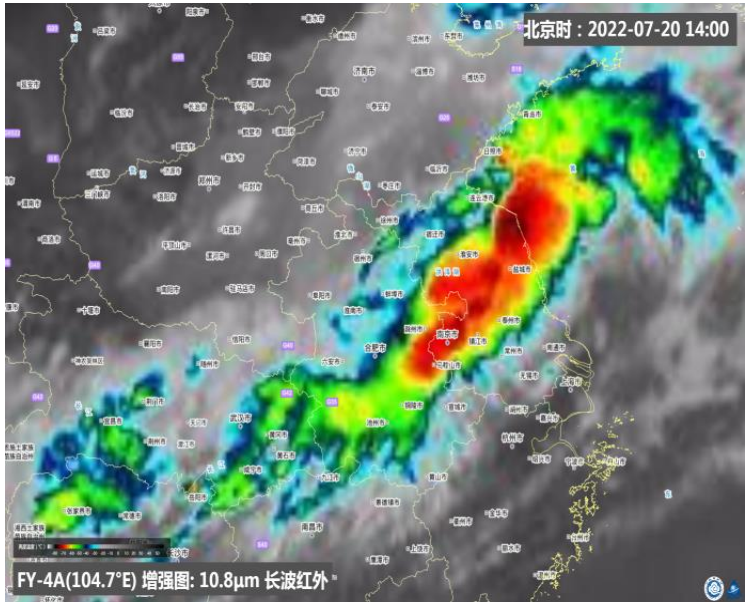


Brightness Temperature change



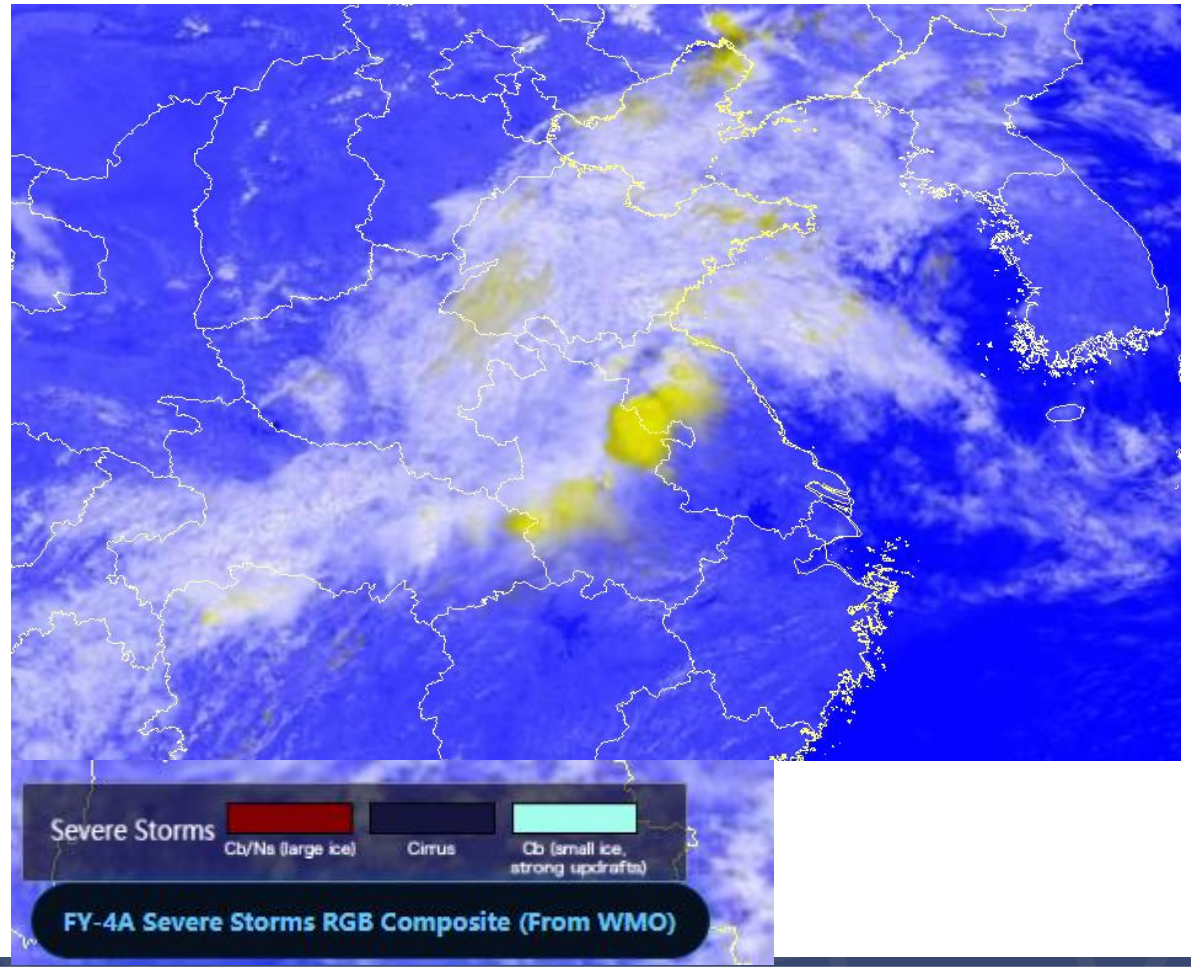
Yancheng City in Jiangsu province



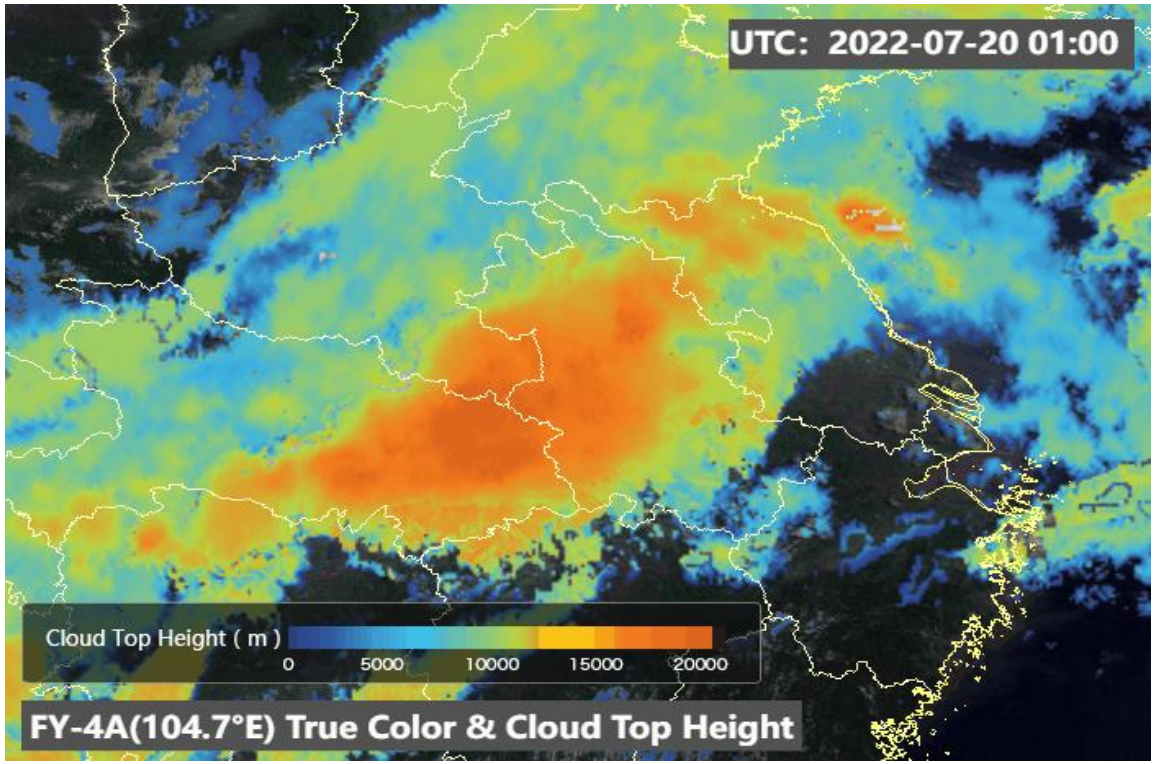


2) Precipitation

Severe Storms RGB composite image (2022.07.20 04:00UTC)

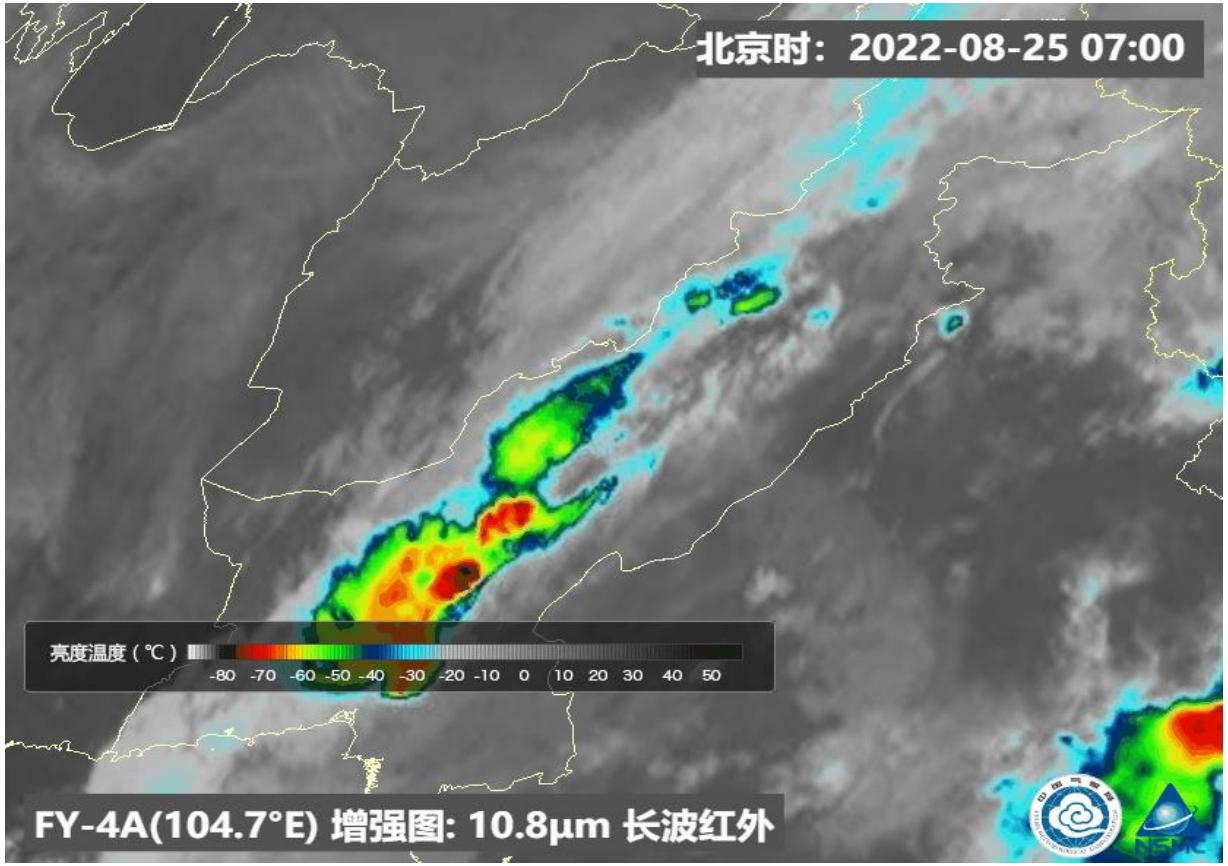


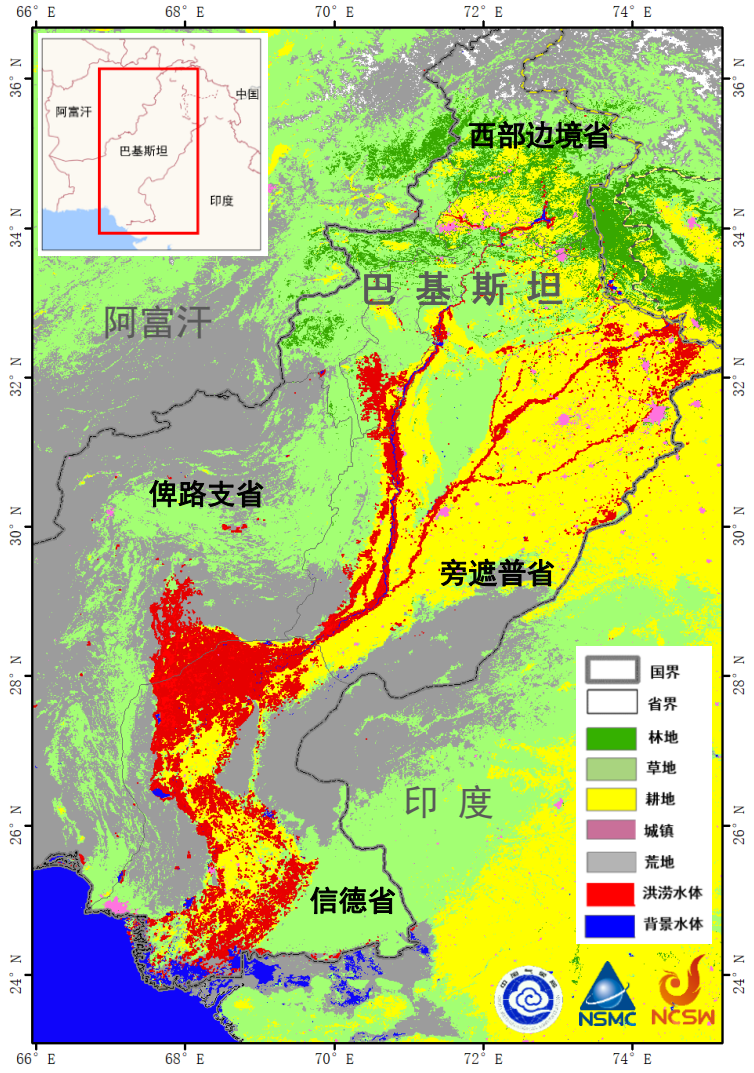
Cloud top height animation



2）Precipitation

Pakistan rainfall





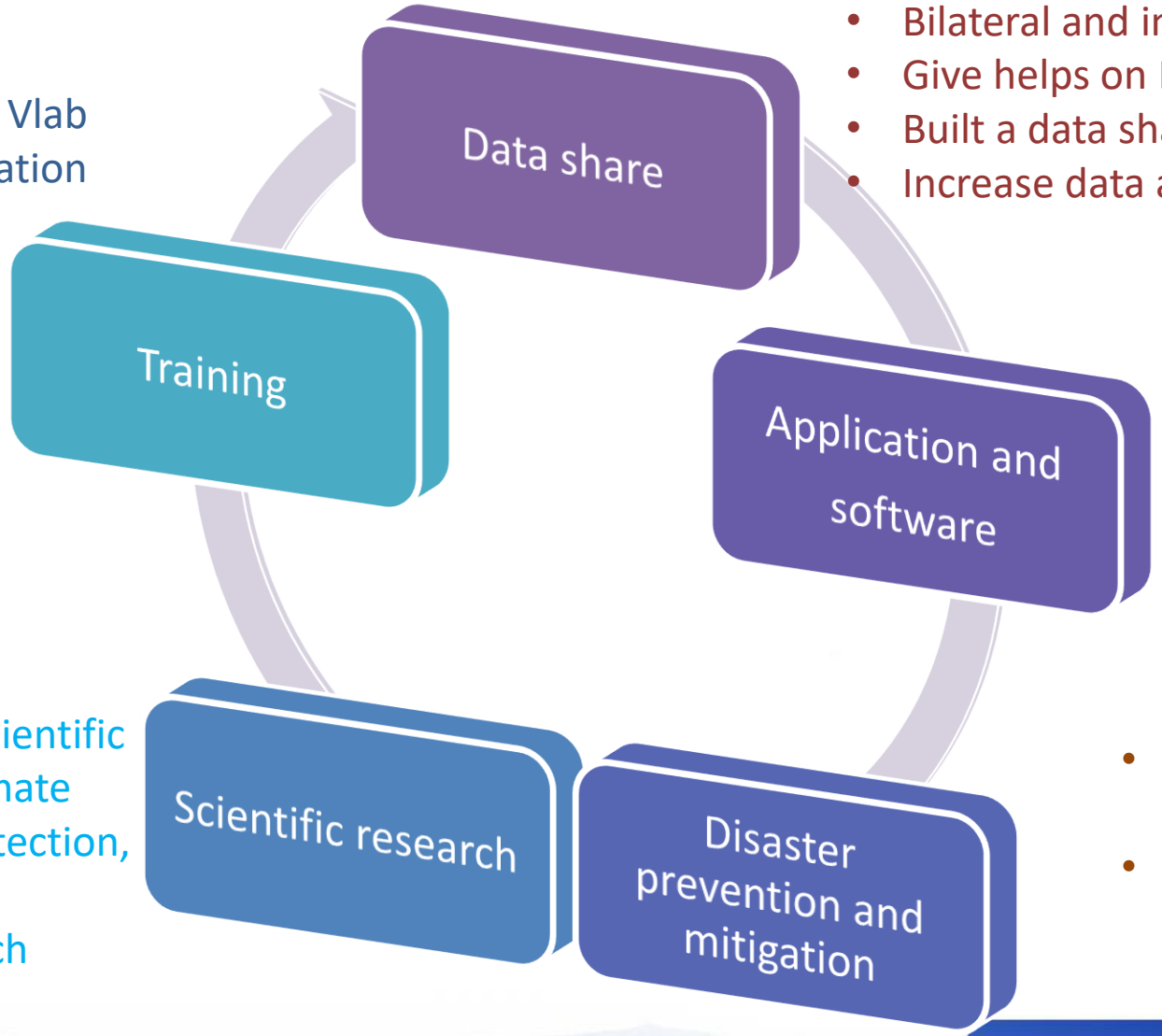
Outline

1. Fengyun Program Overview
2. Data, products and services to B&R countries
3. Typical Applications
4. Case Studies
5. Actions and plans

Implementation Plan for the International Users

Action plan of FENGYUN meteorological satellites supporting for the Belt & Road

- Strengthen cooperation with Vlab
- Training courses on FY application and data usage



- Bilateral and international data exchange
- Give helps on DB and CMACast data receiving
- Built a data sharing service based on public cloud
- Increase data and products

- Improve platforms based on GEO and LEO data face to Asia-Oceania area and Global observation
- Provide more software and toolkit

- Bilateral and international scientific cooperation on weather, climate change and environment detection, etc.
- Built virtual scientific research community

- Strengthen cooperation on FY_ESM
- Increase response data and products

Summary

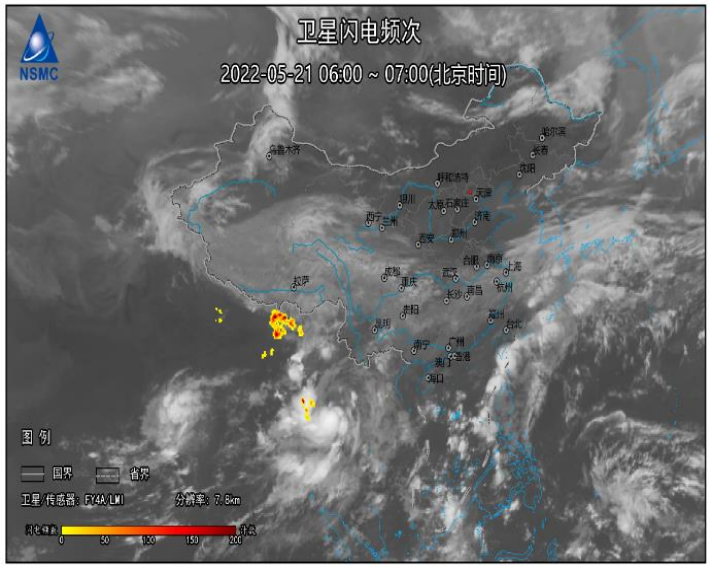
- Nation Satellite Meteorological Center: http://www.nsmc.org.cn/en
- FENGYUN satellite data center: http://data.nsmc.org.cn
- Long-term dataset reprocessing project website: http://www.richceos.cn
- FENGYUN satellite data ftp server (user account required): ftp://ftp.nsmc.org.cn
- FENGYUN satellite data analysis platform: http://rsapp.nsmc.org.cn/geofy/en/
- FY-4A animation: http://fy4.nsmc.org.cn/portal/en/theme/FY4A.html
- FY-4B rapid scan: http://satellite.nsmc.org.cn/metafy/live
- SWAP2.0 (English): http://rsapp.nsmc.org.cn/geofy/en
- SWAP2.0 (Russia): http://rsapp.nsmc.org.cn/geofy/ru
- SWAP2.0 test version (English): http://rsapp.nsmc.org.cn/test_geofy/en
- FY-3 Global Daily Image: https://fy4.nsmc.org.cn/mips/index.html
- FENGYUN Wildfire Watch: http://fyfire.nsmc.org.cn

FengYun Earth

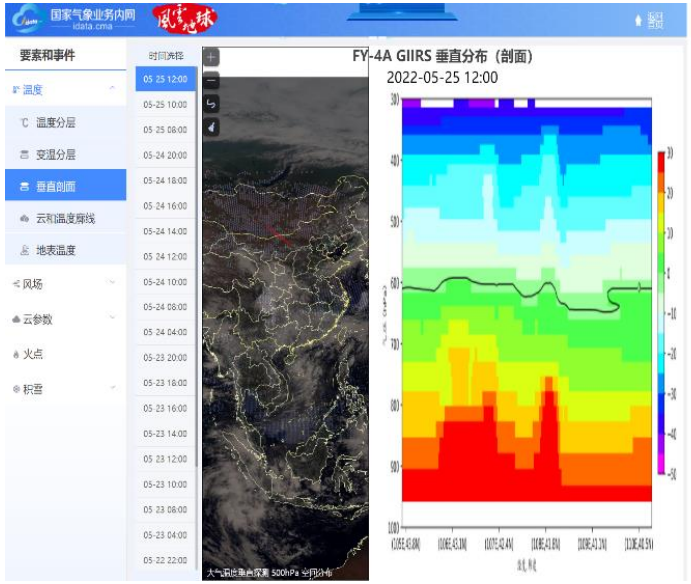
- FengYun Earth is a satellite weather application platform designed for weather forecasters in CMA;
- Developed in Q1 2022, now starting the trial application in National, Provincial, City-level, and County-level Meteorological Services of CMA.

FengYun Earth

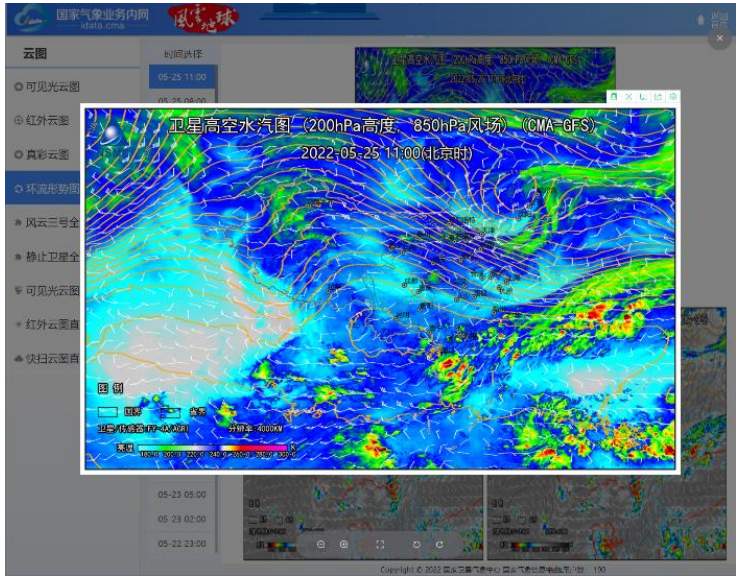
Lighting frequency



FY-4A GIIRS temperature profile



High-altitude water vapor map



Progress in data reprocessing

Retrospective Calibration of Historical Chinese Earth Observation Satellite Data

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About | Data | Document | Members

Position: > Data

Refine By

Type

- Meteorological satellite (13)
- Radiation reference (4)
- Land satellite (5)
- Ocean satellite (6)

Spatial coverage

- GBAL (18)
- DISK (1)
- REGC (1)
- OTHER (8)

Spatial resolution More

- 10M- (1)
- 100M+ (1)
- 10-100M (1)
- 1000M (1)
- 4000M (1)

Time resolution

- ORBT (6)
- POAD (12)
- POAM (8)
- OTHER (2)

Satellite microwave instrument primary climate product data for MWTS

Start Date:2008-11-29 **End Date:**2020-05-09 **Dataset series:**Meteorological satellite **Time resolution:**Orbit

Description: The dataset is created through recalibration based on the FY-3A/B/C/D MWTS L0 data, providing the global atmospheric temperature data from 2008 to 2020. The recalibration process includes the nonlinear modeling, noise characteristic optimization and static parameter modification, and the accuracy of the dataset is less than 1K evaluated by reference instrument comparison.

View details

Fundamental Climate Data Record of meteorological satellite passive microwave instrument-Microwave Radiation Imager (MWRI)

Start Date:2010-11-10 **End Date:**2020-12-30 **Dataset series:**Meteorological satellite **Time resolution:**Orbit

Description: The dataset are created using the new algorithm that improved based on the operational calibration algorithm of MWRI, and the FY3B/C/D MWRI L0 data. The improvement of algorithm including correction of MWRI back lobe emission, correction of MWRI hot reflector emission, correction of hot load efficiency, correction of correction of nonlinear factor. compared with the operational brightness temperature dataset, recalibration dataset are improved in both accuracy and stability.

View details

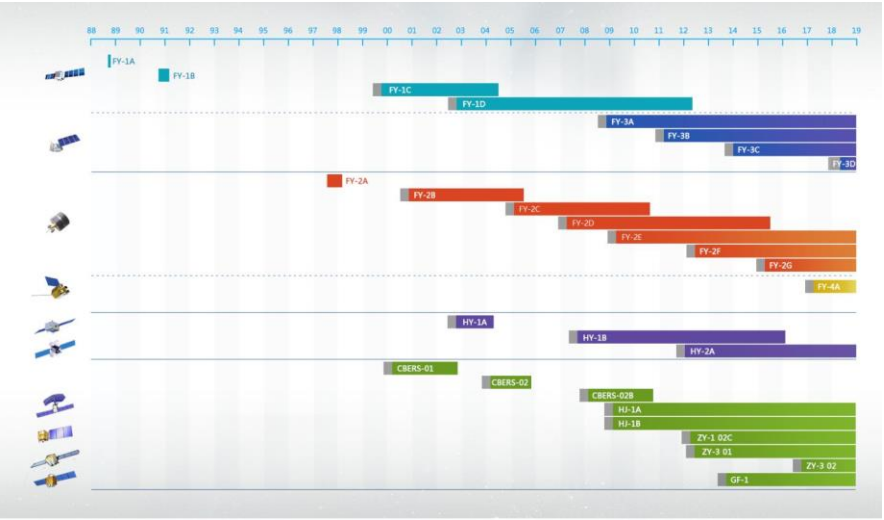
The Fundmental Climatic Data Record(FCDR) of Visible and Infrared Raiometer(VIRR) on Meteorological Satellites (FY-3)

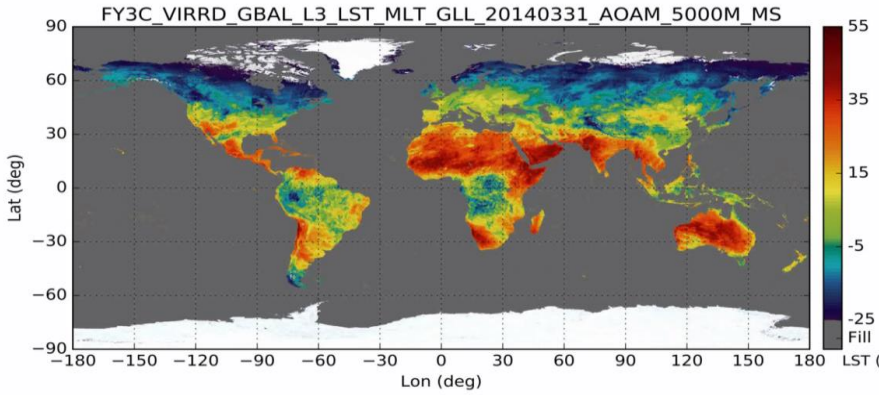
Start Date:2000-01-20 **End Date:**2019-12-30 **Dataset series:**Meteorological satellite **Time resolution:**1 day

Description: This dataset provides the daily recalibration parameters for FY-1C/D and FY-3A/B/C VIRR long-term records for reflective solar bands. Using the calibration coefficients, the recalibrated reflectance could be calculated from the digital number of earth view observations in the operational L1 product, and the recalibrated data records shows improved accuracy and stability.

View details

- 26 CDRs, including meteorological, ocean, land satellites.
- Over 30 years.



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TEŞEKKÜR EDERIM
謝謝
danke
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