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# UPDATED REPORT ON FENG YUN SATELLITE PROGRAM AND DEVELOPMENT

Executive summary

China Meteorological Administration (CMA) is operating FENGYUN (or FY for acronym) geostationary and polar-orbiting satellite systems. Currently, there are seven FY satellites on-orbit, including four geostationary meteorological satellites and three polar orbiting meteorological satellites. Among them, three FY GEO satellites and two FY LEO satellites are operational on-orbit. Their data and products are widely applied in weather analysis, numerical weather forecasting and climate prediction, as well as environment and disaster monitoring.

Since CGMS-49, FY-4B, the first operational new generation geostationary satellite, and FY-3E, the first early-morning orbit satellite in China's polar-orbiting meteorological satellite family have been launched in 2021. The status of current FengYun Satellites, product and data service and the future FengYun satellite plan have been introduced as well.

# 1 INTRODUCTION

The CMA FENGYUN Meteorological Satellite Program includes both geostationary and polar orbit satellite missions. FENGYUN satellites, or FY in acronym, take place in series. The odd number series is the polar-orbiting series, while the even number series is the geostationary. The capital letter after the serial number refers to the seat of a particular satellite in the launching sequence.
In the past year, FY-4B, the first operational new generation geostationary satellite has been launched on June 3, 2021. FY-3E, the first early-morning orbit satellite in China's polar-orbiting meteorological satellite family has been launched on July 5, 2021.
Currently, 5 FY satellites are operational on-orbit, including 2 polar orbit satellites and 3 geostationary satellites. FY-3E and FY-4B will be trial operation since June 1, 2022.

# 2 STATUS OF CURRENT SATELLITE SYSTEMS

## 2.1 Status of Current GEO Satellite

There are three GEO satellites for operational use, which are FY-2G, FY-2H and FY-4A by May 31, 2022. FY-2F has been out of service on April 1, 2022.
FY-4B, which is the first operational geostationary satellite in FY-4 series, was successfully launched from the Xichang Satellite Launch Center on June 3, 2021, and was successfully positioned over the equator at 123.5 degrees east longitude at 17:07 on June 10, 2021. Now it's positioned at 133 degrees east longitude, and will be trial operation on June 1, 2022.

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)<br>SEM(O) |
| FY-4A | 104.7°E | 11 Dec. 2016 | Primary operation for full disk scan | AGRI(O)<br>GIIRS(O)<br>LMI(O)<br>SEP(O) |
| FY-2H | 79°E | 5 Jun. 2018 | Primary operation for full disk scan since 1 Jan., 2019 | VISSR(O)<br>SEM(O) |
| FY-4B | 133°E | 3 Jun. 2021 | Trial operation since 1 Jun., 2022. | AGRI(O)<br>GIIRS(O)<br>GHI(O)<br>SEP(O) |

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

### 2.1.1 Mission objectives, payload/instruments

The primary objectives of FY-2 program are as follows: 1) Continuously observing to obtain the earth imagery in visible, infrared, and water vapour spectral bands, from which sea surface temperature, cloud parameters, and wind vectors can be derived; 2) Operating the Data Collection System (DCS) to collect and transmit data from domestic and overseas data collection platforms (DCPs); 3) Broadcasting data in HRIT/LRIT format, and 4) Monitoring space environment.

There are two main payload carried on FY-2. The detailed descriptions for each payload are as follows.

**S-VISSR** (Stretched Visible and Infrared Spin Scan Radiometer): The improved version for FY-2F/G/H had five VIS/IR channels (0.55-0.75μm, 3.5-4.0μm, 6.3-7.6μm, 10.3-11.3μm, and 11.5-12.5μm). The resolution is slightly improved from 5.76km (IR) and 1.44km (VIS), to 5.0km (IR) and 1.25 (VIS). The image cycle is 30 min.

**SEM** (Space Environment Monitor): A space particle monitor and an X-ray monitor are mounted on FY-2 to detect the space environment in proximity of the satellite, the solar activities and relevant space phenomenon. The SEM is transmitted via telemetry to the ground system.

FY-4 program is the successor of FY-2 program. The primary objectives of FY-4 program are as follows: 1) To take multiple spectral channel imagery of the earth with high temporal resolution; 2) To measure atmospheric vertical profile of temperature and humidity with improved vertical resolution and detection accuracy. 3) To detect and map positions of lightning events. 4) To monitor solar activities and space environments for space weather forecast service. 5) To collect data from data platforms and transmit to users. 6) To broadcast observational images, data and derived products with aboard transponder.

There are four main payload carried on FY4A. The detailed descriptions for each payload are as follows.

**AGRI** (Advanced Geo. Radiation Imager), multi-spectral imager with two independent mirrors scanning north-south and east-west directions respectively; 216 sensors in 14 bands from visible to long-wave infrared (0.55～13.8 μm); on-board calibration for all bands, full optic length of radiation considered in calibration; Spatial resolutions: 1 channel in 1km, 2 channels in 500m, 4 channels in 2 km, 8 channels in 4 km; Sensitivity: S/N 90~200, NEΔT 0.2~0.7 K at 300 K; Full-disk scanning time 15 min.

**GIIRS** (Geo. Interferometric Infrared Sounder), two independent mirrors scanning north-south and east-west directions respectively; 32 x4 plane arrays for mid-wave (375 S/MIR channels) and long-wave infrared bands (538 LWIR channels); resolution: 16km; active and radiate coolers; radiometric calibration accuracy: 1K; spectral calibration accuracy: 10ppm; Mesoscale: 35 min (1000x1000km), China area: 67 min (5000x5000km).

**LMI** (Lightning Mapping Imager), two tubes for observation to achieve more spatial coverage; central wavelength: 777.4nm; S/N ≥ 6; spatial resolution: 7.8km; temporal resolution: 2ms.

**SEP** (Space Environment Package), a suite that contains a Magnetometer for 3-D magnetic field intensity, an Energetic Particle Detector detecting high-energy electron storms (1~165MeV, and >165MeV) and proton events (0.4~4MeV), and Space Weather Effect Detectors for the impact of space weathers on spacecraft.

There are 4 instruments on the FY-4B.The main observation capabilities are similar to those of FY-4A, with some significant performance improvements.

**AGRI,** Compared with FY-4A, 1 new water vapor channel is added, 4 channel band settings are optimized, and the resolution of short wave and medium wave is improved to 2km.

Table 2 Detailed characteristics of AGRI of FY4B

| | Central wavelength | Spectral interval | SNR or NEΔT @ specified input | IFOV at s.s.p. |
|---|---|---|---|---|
| 1 | 0.47 μm | 0.45-0.49 μm | ≥90 @ 100% albedo | 1 km |
| 2 | 0.65 μm | 0.55-0.75 μm | ≥150 @ 100% albedo | 0.5 km |
| 3 | 0.825 μm | 0.75-0.90 μm | ≥200 @ 100% albedo or ≥3 @ 1% albedo | 1 km |
| 4 | 1.378 μm | 1.371~1.386 μm | ≥120 @ 100% albedo or ≥2 @ 1% albedo | 2 km |
| 5 | 1.61 μm | 1.58-1.64 μm | ≥200 @ 100% albedo or ≥3 @ 1% albedo | 2 km |
| 6 | 2.25 μm | 2.10-2.35 μm | ≥200 @ 100% albedo or ≥2 @ 1% albedo | 2 km |
| 7 | 3.75 μm (high) | 3.50-4.00 μm | ≤ 0.7 K @ 315 K | 2 km |
| 8 | 3.75 μm (low) | 3.50-4.00 μm | 0.2 K @ 300 K or 2.0 K @ 240 K | 4 km |
| 9 | 6.25 μm | 5.80-6.70 μm | 0.2 K @ 300 K or 0.9 K @ 240 K | 4 km |
| 10 | 6.95 μm | 6.75-7.15 μm | 0.25 K @ 300 K or 0.9 K @ 240 K | 4 km |
| 11 | 7.92 μm | 7.24-7.60 μm | 0.25 K @ 300 K or 0.9 K @ 240 K | 4 km |
| 12 | 8.55 μm | 8.30-8.80 μm | 0.2 K @ 300 K or 0.4 K @ 240 K | 4 km |
| 13 | 10.80 μm | 10.30-11.30 μm | 0.2 K @ 300 K or 0.4 K @ 240 K | 4 km |
| 14 | 12.00 μm | 11.50-12.50 μm | 0.2 K @ 300 K or 0.4 K @ 240 K | 4 km |
| 15 | 13.30 μm | 13.00-13.60 μm | 0.5 K @ 300 K or 0.9 K @ 240 K | 4 km |

**GIIRS,** the spatial resolution of the infrared channel is increased from 16km to 12km.The resolution of the visible channel has been increased from 2km to 1km.

Table 3 Detailed characteristics of FY4B GIIRS

| Spectral range (μm) | Spectral range ($cm^{-1}$) | Spectral resolution | NEΔR or SNR |
|---|---|---|---|
| 14.7-8.85 μm | 680-1130 $cm^{-1}$ | 0.625 $cm^{-1}$ | 0.5 mW $m^{-2}$ $sr^{-1}$ cm |
| 6.06-4.44 μm | 1650-2250 $cm^{-1}$ | 0.625 $cm^{-1}$ | 0.1 mW $m^{-2}$ $sr^{-1}$ cm |
| 0.55-0.90 μm | N/A | N/A | 200 @ 100 % albedo |

**GHI** (Geostationary High-speed Imager), which is a new instrument on FY-4B, is the first long-line array in geosynchronous orbit to achieve 1-minute continuous imaging and observation capability in a 2000km×2000km area with a resolution of 250m. The visible and near-infrared spatial resolutions are doubled compared to ABI.

Table 4 Detailed characteristics of FY4B GHI

| Central wavelength | Spectral interval | SNR or NEΔT @ specified input | IFOV at s.s.p. |
|---|---|---|---|
| 0.675 μm | 0.45-0.9 | > 300 @ 100 % albedo | 0.25 km |
| 0.470 μm | 0.445-0.495 | > 300 @ 100 % albedo | 0.5 km |
| 0.545 μm | 0.52-0.57 | > 300 @ 100 % albedo | 0.5 km |
| 0.645 μm | 0.62-0.67 | > 300 @ 100 % albedo | 0.5 km |
| 1.378 μm | 1.371-1.386 | > 300 @ 100 % albedo | 0.5 km |
| 1.61 μm | 1.58-1.64 | > 300 @ 100 % albedo | 0.5 km |
| 11.4 μm | 10.3-12.5 | 0.2 K @ 300 K | 2.0 km |

**SEP**, a suite that contains a Magnetometer for 3-D magnetic field intensity, an Energetic Particle Detector detecting high-energy electron storms and proton events, and Space Weather Effect Detectors for the impact of space weathers on spacecraft.

#### 2.1.2 Ground segment matters

The FY-2 ground segment consists of the Command and Data Acquisition Stations (CDAS); the Data Processing Centre (DPC), the Satellite Operation Control Centre (SOCC).

The ground segment of FY-4A consists 9 systems. They are DTS (Data acquisition & Tele-command System), MCS (Mission management and Control System), NRS Navigation & Registration System), CVS (Calibration and Validation System), PGS Product Generation System),DSS (Data Service System), CNS(Computer & Network System),SWAS S (pace Weather Application System), ASVS (Application Simulation Validation System).

Both FY-2 and FY-4 ground segment contains Ranging Stations (one primary station, three secondary stations including one back-up in Melbourne, Australia). The ground segment also includes the DCPs (Data Collection Platform), and HRIT/LRIT stations.

### 2.2 Status of Current LEO Satellite

FY-3B has been stopped for operations on Dec. 9th 2021.

There are two LEO satellites for operational use by May 31 2022, which are FY-3C and FY-3D. FY-3C is in partial operations with 5 payloads. FY-3D is in normal operations with 9 payloads.

FY-3E, which is the first early-morning orbit satellite in China's polar-orbiting meteorological satellite family, was launched on July 5, 2021. It will be trial operation on June 1, 2022.

Table 5 Current Fengyun LEO satellites (as of 1 June 2022)

| Orbit type (Local time of descending node/ascending node) | Satellites currently in orbit | Equatorial crossing time (design specifications) | Equatorial crossing time (present) | Launch date | Status | Main instruments |
|---|---|---|---|---|---|---|
| Mid-Morning orbit (07:00 LT–12:00 LT)/ (19:00 LT–24:00 LT) | FY-3C | 10:00 LT | 07:39 LT | 23 Sept. 2013 | operation | VIRR(O)<br>MERSI(S)<br>IRAS(S)<br>MWRI(S)<br>MWTS-2(S)<br>MWHS-2(O)<br>TOU(O)<br>SIM(S)<br>ERM(O)<br>GNOS(O)<br>SEM(S) |

| | | | | | | |
|---|---|---|---|---|---|---|
| Afternoon orbit (12:00 LT–17:00 LT)/ (00:00 LT–05:00 LT) | FY-3D | 14:00 LT | 13:45 LT | 15 Nov. 2017 | operation | MERSI-II(O)<br>HIRAS(O)<br>MWTS-II(O)<br>MWHS-II(O)<br>MWRI(O)<br>GAS(T)<br>GNOS(O)<br>WAI(O)<br>IPM(O)<br>SEM(O) |
| Early-morning orbit | FY-3E | 5:30 – 5:50 LT | 5:41 LT | 5 Jul. 2021 | Trial operation | MERSI-LL(O)<br>MWTS-III(O)<br>MWHS-II(O)<br>HIRAS-II(O)<br>GNOS-II(O)<br>SIM-II(O)<br>SEM(O)<br>Tri-IPM(O)<br>WindRAD(O)<br>SSIM(O)<br>XEUVI(O) |

**Note:** (O) means the instruments working operationally, (T) means the instruments are working for testing, (S) means the instruments are shutdown.

### 2.2.1 Mission objectives, payload/instruments

The FY-3 polar-orbiting satellite series is developed for LEO service from 2008 to 2027 or beyond. Basically, the FY-3 series are capable of global atmospheric sounding, IR/VIS/Microwave imaging, and space weather monitoring et al. There is plan to develop the capability of precipitation sounding with radar for future missions.
The detailed descriptions for main instruments are as follows:
**VIRR** (Visible and Infra-Red Radiometer), flying on FY-3C, 10-channel VIS/IR radiometer for multi-purpose imagery, resolution 1.1 km, swath 2800 km.
**MERSI** (Medium Resolution Spectral Imager), flying on FY-3C/D, is a 20- channel radiometer (19 in VIS/NIR/SWIR + one TIR at 10.0-12.5μm) for ocean colour and vegetation indexes. Resolution 250m for 4 VIS/NIR and the TIR channel, 1 km for other channels; swath 2800 km. Since FY-3D, the MERSI is evolved to MERSI-2, which has 25 channels (19 in VIS/NIR/SWIR + 6 TIR from 3.7.0-12.5μm).
**MWRI** (Micro-Wave Radiation Imager), flying on FY-3C/D, 6-frequencies/12 channels (all frequencies in double polarization) for multi-purpose MW imagery. Conical-scanning radiometer, resolution 9.5 x 15 km at 90 GHz, 30 x 50 km at 19GHz, swath 1400 km.
**IRAS** (Infra-Red Atmospheric Sounder), flying on FY-3C, 26-channel IR radiometer (including one VIS) for temperature/humidity sounding, resolution 17 km, swath 2250 km.
**HIRAS-II** (High Spectral Infrared Atmospheric Sounder -II), flying on FY-3D, is an infrared sounding instrument with 2287 channels, nadir spatial resolution of 16 km,

cross-track scanning model, mainly for numerical weather prediction and atmospheric composition detection.

**MWTS-II** (Micro-Wave Temperature Sounder), flying on FY-3C/D, 13-channel MW radiometer for nearly-all-weather temperature sounding, 54 GHz band, resolution 70 km, cross-track scanning, swath 2200 km.

**MWHS-II** (Micro-Wave Humidity Sounder), flying on FY-3C/D, 15 channel MW radiometer for nearly-all-weather humidity sounding. 183GHz band, resolution 15 km, cross-track scanning, swath 2700 km.

**TOU/SBUS** (Total Ozone Unit and Solar Backscatter Ultraviolet Sounder), flying on FY-3C, a suite of two UV spectro-radiometers, one (TOU) with 6 channels in the 308-360 nm range, resolution 50 km, swath 3000 km, for total ozone; the other one (SBUS) with 12 channels in the range 252-340 nm, resolution 200 km, nadir viewing, for ozone profile.

**ERM** (Earth Radiation Measurement), flying on FY-3C, 2 broad-band channel radiometer for earth reflected solar flux and earth emitted thermal flux over total (0.2-50μm) and short (0.2-4.3μm) waveband; resolution 28km, cross-track scanning with 2 degree NFOV, swath 2300 km, nadir viewing with 120 degree WFOV.

**SIM** (Solar Irradiance Monitor), flying on FY-3C, 3-channel radiometer over 0.2-50μm waveband for the total incident solar flux; viewing the Sun near the North Pole area.

**GNOS**(GNSS Occultation Sounder), flying on FY-3D, receives signal from GPS or China BeiDou satellites; observing over 1000 occultation events per day.

**GAS**(Greenhouse gases Absorption Spectrometer), flying on FY-3D, has four narrow bands with center wavelength located at 0.76um, 1.6um, 2.1um and 2.3 um, which observes infrared light reflected from the earth's surface and the atmosphere. Column abundances of $CO_2$ and $CH_4$ are calculated from the observational data.

**SEM** (Space Environment Monitor), flying on FY-3C/D, is for in situ observation of charged particles in proximity of satellite.

**WAI** (Wide-field Auroral Imager), flying on FY-3D, is for remote sensing imaging the N2 Lyman-Birge-Hopfield (LBH) auroral bands.

**IPM** (Ionospheric PhotoMeter), flying on FY-3D, for nadir remote sensing the airglow intensity of the OI 135.6nm and N2 Lyman-Birge-Hopfield (LBH) bands.

FY-3E，which has been launched in 2021, is equipped with 11 sets of remote sensing instruments, including: MERSI-LL (medium resolution spectral imager), HIRAS-II (hyper-spectral infrared atmospheric sounder), MWTS-III (Micro-Wave Temperature Sounder), MWHS-II (Micro-Wave Humidity Sounder), GNOS-II (GNSS Occultation Sounder), WindRad (Wind radar), SIM-II (Solar Irradiance Monitor), SSIM (Solar Spectral Irradiance Monitor), XEUVI (Solar X-ray and Extreme Ultraviolet Imager), Tri-IPM (Triple-angle Ionospheric PhotoMeter), and SEM (Space Environment Monitor), among which WindRad, SSIM and XEUVI are new instruments, the MWHS-II is an inherited load, and the performance of 7 instruments including MERSI-LL has been improved.

**WindRad**, is the first active microwave remote sensing instrument of the Fengyun series satellites. It is a dual-frequency, dual-polarization radar. It adopts a fan-beam conical scanning system with an observation width of over 1200km and a minimum detectable wind speed of 3m/s. It adopts C and Ku dual bands to work simultaneously, each band includes two polarization measurement methods, horizontal and vertical.

**SSIM,** measures the solar spectral irradiance through the ultraviolet, visible and infrared channels to obtain the solar spectral irradiance characteristics and capture the influence of solar activity on the spectral irradiance.
**XEUVI,** the world's first solar X-ray-extreme ultraviolet dual-band imager and the first domestic space solar telescope. Two bands: X ray (0.6-8nm) and EUV (19.5nm)
**MERSI-LL**, a total of 7 channels, including 1 low-light channel and 6 thermal infrared channels, of which two infrared split window channels (10.8 and 12.0 microns) have a spatial resolution of 250m, and the remaining channels have a spatial resolution of 1000m.
**HIRAS-II,** an infrared sounding instrument, nadir spatial resolution of 16 km, cross-track scanning model, mainly for numerical weather prediction and atmospheric composition detection.
**MWTS-III**, 13 channels in the original 50~60GHz frequency band have been increased to 17 channels. Added 23.8GHz water vapor column total measurement channel. Add 31.4GHz window channel. Added 53.246 ± 0.08GHz and 53.948 ± 0.081GHz channels for tropospheric temperature detection at 4km and 6km.
**GNOS-II,** receives signal from GPS and China BeiDou satellites; observing over 1000 occultation events per day.
**SIM-II,** is a high-precision absolute radiometer with automatic sun tracking function independently developed by China. Spectral range, 0.2μm～20μm.
**Tri-IPM,** UV spectrometry of the ionosphere performed under 3 different viewing angles.
**SEM,** Monitor high energy proton, high energy electron, medium energy proton, medium energy electron, heavy ions, and geomagnetic field.

#### 2.2.2 Ground segment matters

CMA operates four ground stations to receive the FY polar orbiting satellite data. The ground stations are located in Beijing, Guangzhou, Urumuqi(including Kashgar sub-station), and Jiamusi. The received data are relayed to the Data Processing Center (DPC) through optical fiber link. The data is processed into various products, then disseminated, or archived.
NSMC uses 2 antennas at the North Pole Satellite Station of Esrange Space enter, Kiruna, Sweden to receive FY-3 satellites under contract between CMA and SSC (Sweden Space Company) for long-term on-orbit services of FY-3 and other polar satellite to be operated by NSMC. SSC receives downlinks of FY-3 at the Esrange Ground Station and transfers the data to the Beijing DPC. NSMC has rented TrollSat Station of Norway located near the South Pole to receive FY-3D data.

## 3 PRODUCTS AND SERVICES

### 3.1 Data Resources

NSMC Data Center (Atmospheric Remote Sensing Satellite Data Center) is responsible for Fengyun series satellite and the third-party satellite data management and long-term preservation. By the end of 2021, NSMC has stored data volume up to near 25PB from 50 satellites, 92% of the archive is FengYun series satellite data. Cumulative annual archive data volume from 1988 to 2021 in NSMC shows in the figure 1. Data and products specification and details can be found on NSMC web portal (http://www.nsmc.org.cn).

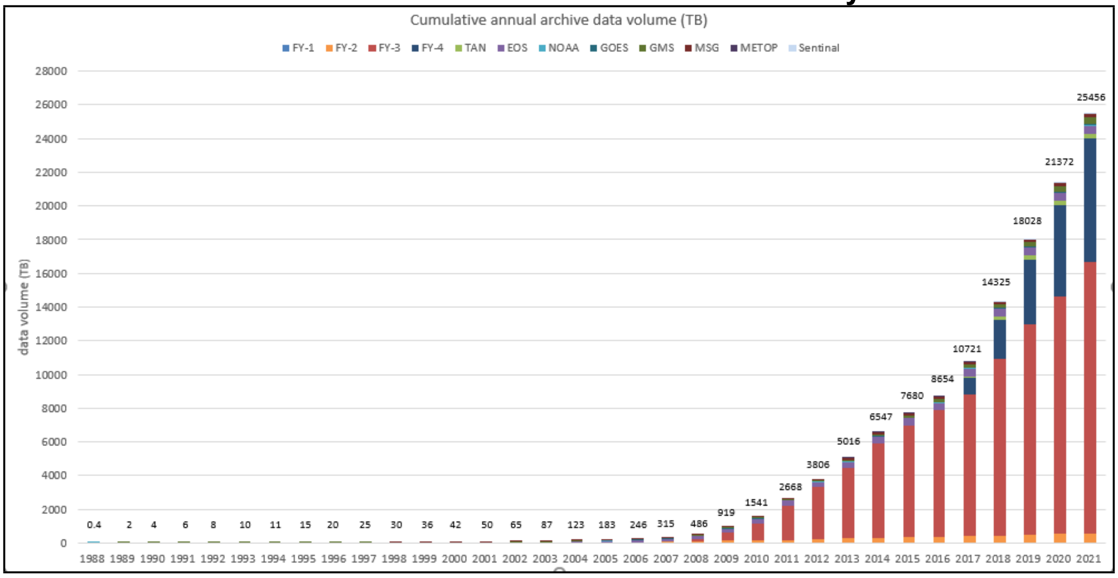


Fig 1 Cumulative Annual Archive Data Volume in NSMC

### 3.2 Data Service

FengYun Meteorological Satellites data are shared globally in real-time and open to global users. There exist several ways for global community to get FengYun meteorological satellite data. Users in FY satillites direct broadcast service area with appropriate receiving equipment can directly receive real time data. The CMACast users can receive data and product with DVB-S equipment in near real time. The full FengYun meteorological satellite dataset, both real time and historical data will be available on NSMC satellite data service website in English version (http://data.nsmc.org.cn). Users can search and download data after registration.

By the end of 2021, more than 120 thousands users registered on NSMC satellite data service website. Near 9PB satellite data has been delivered to domestic and international users in 2021. NSMC satellite data service website has processed near 140 thousands orders and retrieved 501 TB satellite data for users.

## 4 FUTURE SATELLITE SYSTEMS

### 4.1 Future Fengyun LEO Satellites

FY-3F is a mid-morning orbit satellite with descending equatorial crossing time 10:00 AM. It’s scheduled to be launched in the end of 2022. There are 10 remote sensing instruments on it including MERSI-III, MWTS-III, MWHS-II, MWRI-II, GNOS-II, HIRAS-II, Ozone Measurement Suite -Nadir (OMS-N), Ozone Measurement Suite - Limb (OMS-L), the ERM-II and SIM-II.

FY-3G, which is an inclined low earth orbit satellite mainly used for precipitation measurement, is scheduled to be launched in the end of 2022. There are 4 remote sensing instruments on it including MERSI (simplified form), MWRI (for precipitation), GNOS-II, and the Precipitation Measuring Radar (PMR).

FY-3H is an afternoon orbit satellite, which is scheduled to be launched in 2023. Its local time at ascending node is 14:00 PM. There are 9 remote sensing instruments on FY-3H, MERSI-III, MWTS-III, MWHS-II, MWRI-II, GNOS-II, HIRAS-II, GAS-II, WAI-II, and IPM.

FY-3I, the second precipitation measurement satellite of CMA, is scheduled to be launched in 2026. The instruments on FY-3I inherit the overall observation capability of the FY-3G instruments.
FY-3J is the follow-on satellite of FY-3E, and the second early-morning orbit satellite in China's polar-orbiting meteorological satellite family, which is scheduled to be launched before 2027. The technical status of the 11 instruments is basically the same as those of the FY-3E.

### 4.2 Future Fengyun GEO Satellites

FY-4C is scheduled to be launched in 2024. The remote sensing instruments are including AGRI, GIIRS, LMI, SEP, the Multiband Ionospheric Ultra-Violet Spectrum Imager (MUSI), the Solar Extreme-Ultraviolet Imager (SUVI), and the Solar X-EUV Irradiance Sensor (SXUS).
The first satellite of FY-4 MW series is planned to be launched in 2025. The main payload is the microwave sounder, which can perform full-disk observation and regional observation.