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Summary of the Working Paper.

The FY-1 polar-orbiting meteorological satellite program started in 1988. The first FY-1 satellite FY-1A was launched on 7 September 1988. Up today, the Program has produced four satellites, namely the FY-1A/B/C/D. FY-1 satellites are 3-axis stabilized, carry instruments of Multi-channel Visible and Infrared Scanning Radiometer (MVISR) for the earth environment monitoring at sub-point resolution 1.1km; and Space Environment Monitor (SEM) for in situ observation of charged particles in solar wind. Direct Readout Service is available on FY-1 series satellites through HRPT transmission. Currently, the FY-1D is in operation and it shall be last satellite by the FY-1 Program.

Status of Chinese FY-1 Polar Orbiting Satellite Program (As of 30 September 2007)

Introduction

The FY-1 polar-orbiting meteorological satellite program started in 1988. The first FY-1 satellite FY-1A was launched on 7 September 1988. Up today, the Program has produced four satellites, namely the FY-1A/B/C/D. FY-1 satellites are 3-axis stabilized, carry instruments Multi-channel Visible and Infrared Scanning Radiometer (MVISR) with sub-point resolution 1.1km good for the earth environment monitoring, and Space Environment Monitor (SEM) for in situ observation of charged particles in solar wind. Direct Readout Service is available on FY-1 series satellites through HRPT transmission.

Table .1 – Chronology of the FY-1/FY-3 programme (in bold the satellites active in Sept 2007)

Satellite	Launch	End of service	Height	LST	Status (Sept 2007)	Instruments
FY-1A	7 Sep 1988	16 Oct 1988	900 km	11.30	Inactive	MVISR, SEM
FY-1B	3 Sep 1990	5 Aug 1991	900 km	16.00	Inactive	MVISR, SEM
FY-1C	10 May 1999	26 April 2004	862 km	6.45	Inactive	MVISR, SEM
FY-1D	15 May 2002	expected ≥ 2007	866 km	8.20	Operational	MVISR, SEM

FY-1A was launched on 7 September 1988. It is the first meteorological satellite ever made by China. The MVISR onboard has five observational channels(0.58-0.68µm, 0.725-1.1µm,0.48-0.53µm,0.53-0.58µm,10.5-12.5µm). Satellite failure was announced not long after the launch when the attitude became uncontrollable.

FY-1B was launched on 2 September 1990. It is a copy of the FY-1A due for the experiment task by the FY-1 program. A series test was made with FY-1B including the tests to improve the FY-1 ground component. The satellite is abandoned on August 1991 due to attitude failure.

FY-1C was launched on 10 May 1999. FY-1C sees some improvements from its predecessor: the size of solar panel is enlarged, the MVISR has 10 observational channels instead of five. Most importantly, the attitude stability is much improved. Data acquisition and archive at CMA/NSMC for the FY-1C ceased on 26 April 2004 due to obvious degradation of data.

FY-1D, whose capability is identical with the FY-1C, was launched on 15 May 2002. It is the last satellite by the FY-1 Program. Operationally, it is active.

Status of Currently Operational FY-1 Satellite: FY-1D

- 1) Orbital Parameter : See Table 2.

Table. 2 – Orbit Parameters of FY-1D Satellite

Satellite	Orbit	Altitude	Inclination	Eccentricity	Descending Node LST
FY-1D	Sun-synchronous	866 Km	98.80°	<0.005	6:50 am

2) FY-1D MVISR Channels and Primary Use: See Table 3.

Table. 3 – MVISR Channels and Primary Use

Channel	Wavelength (μm)	Primary Use
1	0.58-0.68	Daytime cloud, ice and snow, vegetation
2	0.84-0.89	Daytime cloud, vegetation, water vapor
3	3.55-3.95	Heat source, night cloud
4	10.3-11.3	SST, day/night cloud
5	11.5-12.5	SST, day/night cloud
6	1.58-1.64	Soil moisture, ice/snow distinguishing
7	0.43-0.48	Ocean color
8	0.48-0.53	Ocean color
9	0.53-0.58	Ocean color
10	0.90-0.965	Water vapor

4) FY-1D MVISR Calibration Coefficients

MVISR calibration coefficients are adjusted every year with field measurements. Table 4 gives the updated calibration coefficients.

Table. 4 – FY-1D MVISR Calibration Coefficients

Channel	Slope	Intercept
1	8.930 E-02	-1.0719
2	9.980 E-02	-1.1972
6	8.310 E-02	-2.4113
7	4.230 E-02	-0.5498
8	6.310 E-02	-0.757
9	8.170 E-02	-1.0624
10	8.920 E-02	-1.2486

FY-1 Satellite Data Transmission

High Resolution Picture Transmission(HRPT): direct read-out for the whole information at full resolution in digital form at S-band frequencies. Main features:

- frequencies: 1700.4MHz; bandwidth: 5MHz; polarization: right-hand circular
- antenna diameter~ 2m, G/T~ 6.0dB/K, data rate ~ 1.33 Kbps

Delayed Picture Transmission(DPT): MVISR imagery is stored on board and transmitted to ground station in S-band. Main features:

- frequency 1708.5MHz; bandwidth: 3 MHz; data rate~ 1.33Mbps.
- DPT is capable of two forms of data format:
 - GDPT format: global data of 4 channels (0.58-0.68μm, 0.84-89μm,10.3-11.3μm,11.5-12.5μm) with resolution reduced to 3.3 Km;
 - LDPT format: limited-area data of 10 channels with 1.1Km resolution.